# Imperial Bureau of Plant Breeding and Genetics

## Plant Breeding Abstracts

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*Note.*—Initialled abstracts are written by the following:—

Dr H. O. Hartley .. .. .. .. .. H. O. H.
Mrs R. M. Ingham .. .. .. .. .. R. M. I.

* General studies, see also individual crops.

# Plant Breeding Abstracts.

## Vol. XI, No. 3.

### Part 1. Empire Section

STATISTICS 519

497. COCHRAN, W. G. 519.24
**The analysis of variance when experimental errors follow the Poisson or the binomial law.**
Ann. Math. Statist. 1940 : **11** : 335–47.

Most statistical tests are based on the assumption that the data are normally distributed. On the other hand some experimental records such as certain percentages and ratios are known to be distributed according to the binomial law; others, mainly records of rare occurrences such as the incidence of a rare disease, are known to follow the Poisson law.

To make standard statistical tests applicable to an analysis of such data certain mathematical transformations have frequently been used. Data following the Poisson law can often be analysed by "normal theory" if the square root of the records is used in place of the original data. Similarly, experimental records following the binomial law may be made amenable to standard tests by the transformation $sin^{-1}\sqrt{x}$.

In this paper the author investigates the theoretical basis of these transformations and illustrates them by numerical examples. H. O. H.

498. KRISHNA IYER, P. V. 519.24
**Standard error of the difference between two estimates for incomplete block experiments.**
Curr. Sci. 1941 : **10** : p. 165.

"A simple method for calculating the standard error of the difference between two treatment estimates for any experiments is given". The method is particularly useful for asymmetrical experiments.

499. O'NEIL, J. B. and GUTTERIDGE, H. S. 519.24
**A note on the calculation of standard errors for treatment means after adjustment for regression.**
Sci. Agric. 1941 : **21** : 358–59.

Methods of calculating the standard errors of treatment means adjusted for regression are already available for the cases of one and two independent variables. In the present paper these methods are extended to the case of four independent variables.

500. CORNISH, E. A. 519.24:631.421
**The analysis of covariance in quasi-factorial designs.**
Ann. Eugen. 1940 : **10** : 269–79.

The analysis of covariance as applied to standard designs of field experiments is now commonplace. Its object is the joint analysis of "concomitant measurements" taken for each experimental plot. Thus in an experiment on barley we may measure the yield per plot, the average 1000-corn weight, the nitrogen contents, etc., obtained under various treatments and study their relations and correlations.

In this paper the author applies this analysis to modern complex designs, viz. balanced incomplete blocks, quasi-Latin squares, and quasi-factorial designs in randomized blocks. He illustrates the technique with Immer's data from a unifomity trial on sugar beet by superimposing dummy treatments in accordance with the above designs. Only two concomitant measures are considered, viz. the apparent purity of the sugar extracted from the beet and the sugar percentage. The analysis of the sum of products (covariance) is on lines first given by Yates for the corresponding analysis of the sum of squares (analysis of variance) in the respective quasi-factorial designs. H. O. H.

501. L. . . . ., H. M. 575:633

**Limitations in plant breeding.**

Int. Sug. J. 1941 : 43 : 77–79.

The relations between genetics and plant breeding are considered. It is pointed out that many "characters" are complex. The importance of polyploidy to the plant breeder is also mentioned.

502. Ramiah, K. 575:633(54)

**Plant breeding and genetical work in India.**

28th Indian Sci. Congr. Benares, 1941 : Sect. XI, Agric. Pp. 30.

A survey is given of the plant breeding work in India. Of the total area under the four main crops 74·8% is planted with new improved varieties in the case of sugar cane, 22·2% in the case of cotton, 19·5% in wheat and only 5·2% in rice; even in rice the area is very much higher in those provinces where active plant breeding has been pursued. After a discussion of the peculiarities of Indian conditions an outline is given of plant breeding methods, under the headings of selection, hybridization, the possible advantages of strain mixtures and the contributions of genetical science.

In assessing the achievements of plant breeding in India the conclusion is reached that modern genetical knowledge has played little or no part in plant improvement but the value of the newer statistical methods of approach is illustrated. The importance of heterosis and of various forms of correlation are discussed and an example is referred to where small correlation coefficients of the order of — 0·2 to —0·4 have had an appreciable effect when continuous selection is carried on for the two characters concerned, as in the case of ginning percentage and lint length in certain cotton crosses instanced.

In reviewing the possibilities of wide crosses and the use of imported material for breeding, the author concludes that for such crops as *Gossypium arboreum* and rice, which have Indian centres of distribution, little or no advantage is to be gained by introducing types from abroad. A more intensive study of the existing local types is advocated and the possibilities are illustrated by reference to economically important drought resistant rices obtained from the cross *Oryza sativa* and *O. longistaminata*. The limitations of wide crosses are however also discussed, with particularly illuminating evidence relating to the effects of pleiotropy. The homozygous lintless type in cotton has been found to be at the same time shorter, later, different in growth rate and in survival capacity. Analogous cases in rice are cited.

The value of genetical knowledge in connexion with the maintenance of seed purity and the production of improved strains is emphasized, and suggestions are made for the improvement of genetical study in India.

503. 575:633(62)

Philp, J. 633.11:575

**On wheat breeding and genetics.**

Proc. 7th Int. Genet. Congr. Edinburgh 23–30 August, 1939 (1941) : p. 237. (Abst.)

A very brief account is given of the application of genetical knowledge and experience to plant breeding work in Egypt. Efforts were first concentrated on selection both within the long-established crops and within imported material of relatively new crops. Improvements in yield, ranging from 7 to 38%, were obtained in a large number of crops. The basic principles of genetics were applied in the methods adopted for hybridization, selection, and the propagation of pure strains. Developmental studies of Egyptian wheats have been applied with advantage in the hybridization and selection work to obtain varieties of improved yield. A knowledge of the cytogenetic behaviour of pentaploid wheat hybrids has been a valuable guide in breeding for rust-resistant *vulgare* types from interspecific crosses.

504. Goulden, C. H. 575:633:575.42

**Problems in plant selection.**

Proc. 7th Int. Genet. Congr. Edinburgh 23–30 August, 1939 (1941) : 132–33. (Abst.)

This is a general discussion on the problems of plant selection from progenies of crosses between self-fertilized plants. It is pointed out that the present methods of breeding are based on the principle that progress in obtaining lines having the required desirable characters can be made at the same time as the lines are being selected for homozygosity. An alternative method

would be to grow very small single plant progenies and when they are more or less homozygous to test large numbers of them by means of the methods devised by Yates. It is also pointed out that, while reliable yield tests can be carried out on a large group of varieties, the breeder still has to evaluate the varieties for such characters as strength of straw, disease resistance and quality of grain.

505. Briggs, F. N. 575:633.1–2–1.521.6
**The use of the backcross in plant breeding.**
Proc. 7th Int. Genet. Congr. Edinburgh 23–30 August, 1939 (1941) : 81–82. (Abst.)

The importance of the back-cross method in cereal breeding is stressed. By this method genes for disease resistance, for example, can be added to the favourable gene complex of a high yielding and well adapted variety. As examples of the use of the back-cross method the author mentions the transference of the bunt resistance of the wheat variety Martin to commercial Californian wheats, the incorporation of the stem rust resistance of Hope wheat in the varieties White Federation and Baart, and finally the incorporation of resistance to bunt, stem rust and Hessian fly in Big Club and Poso wheats.

## GENETICS 575.1

506. 575.243:535.61–31:633.15
Stadler, L. J. 575.243:537.531:576.356.2
**Genetic studies with ultra-violet radiation.**
Proc. 7th Int. Genet. Congr. Edinburgh 23–30 August, 1939 (1941) : 269–76.

The genetic effects of ultra-violet radiation on maize pollen are discussed and compared with those produced by X-rays. The experiments consisted in pollinating a multiple recessive with pollen from a multiple dominant, the pollen being irradiated immediately before pollination. The technique used in determining the frequencies of the four types of genetic effect—mutations, deficiencies, chromosome rearrangements and embryo abortion—are outlined.
The first interest of the ultra-violet experiments is the possibility of breaking down the four types of genetic effect which always occur together in the X-ray experiments (see also "Plant Breeding Abstracts", Vol. X, Abst. 994). Thus, although ultra-violet light like X-rays produces numerous endosperm and other deficiencies, embryo abortions and recessive mutations, there is a striking difference from X-rays in that chromosome rearrangements are very rare after ultra-violet treatment. Also with filtered ultra-violet radiation, from which wave lengths shorter than $\lambda 297$ have been removed, there is a sharp drop in the frequency of aborted embryos without a corresponding drop in the frequency of endosperm deficiencies. The spectral relations of deficiencies and mutations are, however, similar.
Secondly it is of interest to note that the spectrum of genetic effectiveness of ultra-violet radiation, in so far as it could be determined within the limitation of the experiments, is not greatly different from the absorption spectrum of nucleic acid.
The third interest of the ultra-violet work is in the genetic analysis of the induced alterations. It was found that the endosperm deficiencies induced by ultra-violet radiation differ from those produced by X-rays in that a large number of them are fractionals affecting about one-half of the endosperm. This suggests that the chromosomes behave as already double to ultra-violet radiation at a time when most of them appear to be still single from the X-ray results. Another striking difference between the effects of the two types of irradiation is the extremely low frequency of deficiencies affecting the embryo after ultra-violet treatment. Also all the ultra-violet induced deficiencies detectable at pachytene have the appearance of terminal deficiencies, while X-ray induced deficiencies are both terminal and non-terminal.
Finally it is emphasized that the ultra-violet results show that mutations may be produced in high frequency by a treatment that has little if any effect on the occurrence of chromosome rearrangements.

507. Catcheside, D. G. 575.243:576.356.2
**The mechanism of radiation-induced chromosome rearrangements.**
Proc. 7th Int. Genet. Congr. Edinburgh 23–30 August, 1939 (1941) : p. 86. (Abst.)

The author is of the opinion that in induced rearrangements requiring two or more breaks the different breaks may be either independent or related, but are much more frequently related.

508. MATHER, K. 575.42
**Selection for polygenic characters.**
Proc. 7th Int. Genet. Congr. Edinburgh 23–30 August, 1939 (1941) : 211–12. (Abst.)
It is pointed out that, since the most important characters of crop plants are polygenic in inheritance, selection for such characters would be much facilitated by a detailed knowledge of their hereditary behaviour. Suitable methods of statistical analysis are now available for studying the inheritance of such characters. It is also suggested that there is no *a priori* reason for the assumption that all genes involved in the control of one character show the same dominance relations. In selected material such as crop plants, however, there will be a tendency for the larger number of segregating genes to show dominance in the direction of selection. The effect of the interaction of genes and of the effective number of genes on the inheritance of polygenic characters and selection are very briefly discussed. Finally it is pointed out that the main effect of linkage appears to be in "damping" the observable variability of polygenic characters (cf. also "Plant Breeding Abstracts", Vol. XI, Abst. 252).

## CYTOLOGY 576.3

509. SCHULTZ, J. 576.312.341
**The function of heterochromatin.**
Proc. 7th Int. Genet. Congr. Edinburgh 23–30 August, 1939 (1941) : 257–62.
The relation of the nucleic acids to the genes, the role of the nucleic acids in the synthetic processes of the cell and the function of heterochromatin are all considered in this stimulating paper. The experimental work discussed in the article was mainly done with *Drosophila.*

510. BLAKESLEE, A. F. 576.356.5:581.04
**The induction of polyploids and their genetic significance.**
Proc. 7th Int. Genet. Congr. Edinburgh 23–30 August, 1939 (1941) : 65–72.
This is an address given by Dr. A. F. Blakeslee in opening a round-table discussion on the use of colchicine in inducing polyploidy. It is pointed out that many workers have made contributions in this field. The methods of applying colchicine to the growing-points and the characters of induced tetraploids are discussed. Mention is also made of polyploidy and sex, "multiple diploids" (= amphidiploids), the production of pure lines from haploids, chromosome deficiencies after colchicine treatment, induced periclinal chimaeras and the induction of extra-chromosomal types.

511. MÜNTZING, A. 576.356.5:581.162.5
**Incompatibility and fertility in experimental and natural polyploids.**
Proc. 7th Int. Genet. Congr. Edinburgh 23–30 August, 1939 (1941) : p. 224. (Abst.)
A more or less pronounced barrier of incompatibility is usually found between experimental autotetraploids and amphidiploids and their original diploid forms. A similar behaviour is characteristic of natural intra- and interspecific polyploids.
Fertility and cytological stability in allo- as well as in autopolyploids is partly a biotype question. In barley significant differences were found between tetraploid strains from different diploid strains as regards fertility and frequency of aberrants. Different degrees of fertility and cytological stability have also been found in strains of *Triticale* (cf. "Plant Breeding Abstracts", Vol. X, Abst. 107).

## PLANT DISEASES 632

512. MEHTA, K. C. 632.452:633.1:576.16
**Further studies on cereal rusts in India.**
Sci. Monogr. Imp. Coun. Agric. Res. 1940 : No. 14 : Pp. vii + 224.
An account is given of those physiological races of *Puccinia graminis tritici, P. graminis avenae, P. triticina* and *P. glumarum* which are found in India. The seedling reactions of the differential hosts to the different races of the rusts are tabulated.

## ECONOMIC PLANTS 633

513. 633(67.6)
**Food crop varieties available for distribution.**
E. Afr. Agric. Res. Sta., Amani 1941 : January : Pp. 8.
In view of the increasing interest in food crops throughout the Empire this list, which is apparently published for use in British East Africa, may have a wider interest.

514. Bell, G. D. H. 633.1:575(42)
**Cereal breeding and research at the Cambridge University Plant Breeding Station.**
Proc. 7th Int. Genet. Congr. Edinburgh 23–30 August, 1939 (1941) : p. 62. (Abst.)

There are two main objectives in the most recent work in wheat breeding at this station—the development of high yielding winter varieties showing a high degree of resistance to *Puccinia glumarum* and the improvement of spring wheats by hybridizing them with winter types. In barley breeding three main problems are being tackled. First the improvement of two-row malting barleys is being attempted by hybridization of the existing improved types, of the old standard types and of the two former types with the new Danish hybrids. Secondly attempts are being made to produce two-row winter-hardy forms for both malting and feeding purposes by hybridizing the standard English types with continental forms. The improvement of the field characters of six-row barleys is being tried by crossing them with two-row forms and with other six-row types. The oat breeding work is largely concerned first with obtaining winter-hardy varieties, secondly with obtaining low husk percentage types and thirdly with breeding for resistance to frit fly (*Oscinella frit*).

515. Breakwell, E. J. and
Mellor, D. H. S. 633.1:575(94.2)
**Plant breeding and some experimental work at Roseworthy College, 1939-40.**
J. Dep. Agric. S. Aust. 1940 : **44** : 252–61.

A summary is given of the precautions which the pure seed station takes in the production of pure stocks of cereal varieties. The season 1939–40 was valuable from two aspects for the plant breeding work—there was a moderate infection of stem rust and shattering (or "shaking") was very severe. A large number of rust-free selections of wheat were made. Accounts are then given of the wheat, oats and barley trials and of pea breeding. There are notes on the most promising crossbred lines of all three cereals.

516. Tschermak von Seysenegg, E. 633.1:575.127.5:581.163
Weitere Beobachtungen über hybridogene Pseudoparthenogenesis. (**Further observations on pseudo-parthenogenesis as a result of hybridity**).
Proc. 7th Int. Genet. Congr. Edinburgh 23–30 August, 1939 (1941) : 299–301. (Abst.)

In attempted intergeneric crosses fruit development without seed production or in other cases the production of seeds which give rise to plants resembling the female parent may occur. The author suggests that in such cases the pollen tube reaches the embryo-sac and that, although the male nuclei are eliminated, the embryo-sac is stimulated to develop. An embryo of the maternal species is thus produced. Such embryos always produce diploid (not haploid) seeds finally. "Hybridogenous pseudo-parthenogenesis" is the term used by the author to describe this phenomenon. In some cases it is possible to show that the endosperm of a seed is of hybrid origin while the embryo is of the maternal type, e.g. in the cross blue-grained wheat x yellow-grained *Lolium* the endosperm was yellow (yellow is dominant to blue) but the embryo was wheat only. In a previous paper (cf. "Plant Breeding Abstracts", Vol. VI, Abst. 92), the author has discussed the occurrence of "hybridogenous parthenogenesis" in crosses between members of the Leguminosae. In the present paper numerous instances are given of the production of matroclinous seeds in crosses of wheat and barley as female parents with other members of the Gramineae as male parents. Three well developed seeds were also obtained from pollinating wheat with *Lilium candidum*. It is pointed out that the production of these matroclinous seeds is not due to faulty emasculation.

517. Hunter, H. 633.1–2.111–1.521.6:575(41)
**Winter hardiness in cereals.**
J. R. Agric. Soc. 1941 : **101** : Part 2 : 28–36.

After a general discussion of the physiological aspects of winter-hardiness in cereals, with special reference to phases of hardening and phases of plant development, breeding experience in Great Britain is briefly reviewed.
The damage observed at Cambridge in the winters 1938–39 and 1939–40 to a range of varieties

of wheat, oats and barley is recorded. Though the frosts were much more severe and prolonged in 1939–40 the damage in 1938–39 was as bad or worse, because of the very mild autumn of 1938.
In breeding winter wheats for Great Britain, no serious difficulty has been encountered with regard to winter-hardiness. In the case of barley the work is facilitated by the existence of several truly winter-hardy parents. But in the case of oats the range of winter-hardy forms is rather limited and the hardy forms, Grey Winter, Avoine d'Hiver and certain Russian forms, have very poor standing power. It has therefore been necessary to cross them with spring varieties, and though this has brought about improvement of agronomic characters the full winter-hardiness of the hardy parent has proved very difficult to recover. Considerable progress has been made by back-crossing the best derivatives to Grey Winter.
It is emphasized that while winter-hardy forms usually have a prostrate early growth, this character is unreliable as an index of hardiness.

## WHEAT 633.11*

518. SHEN, T. H. 633.11:575(51)
**Adaptability of wheat varieties in relation to the various regions and breeding centres in China.**
Proc. 7th Int. Genet. Congr. Edinburgh 23–30 August, 1939 (1941) : 262–63. (Abst.)
The differentiation of six wheat producing regions made in an earlier study (see "Plant Breeding Abstracts", Vol. VII, Abst. 938), have been confirmed and it is suggested that they can be combined into three main regions, the northern region with semi-arid climate and very severe winter, the central region with semi-arid climate and rather severe winter where spring wheat cannot be grown satisfactorily and the southern region with humid weather and mild winter where both spring and winter wheats can be grown satisfactorily.

519. ROBERTS, W. 633.11:575(54.5)
**Work on Punjab wheat since 1906.**
Indian Fmg 1941 : **2** : 10–11.
In 1906 Sir Albert Howard started isolating varieties in the Punjab and found 25 distinct types, of which Punjab 11 was released by the author on a large scale from 1912 onwards. In the meantime Milne conducted field surveys of wheat and he and his successors isolated several new types such as 8A and 8B. R. B. Ramdhan Singh produced C591 from the cross 8B x Punjab 9 and C518 from 8A x Punjab 9. These two varieties are now grown over an area of at least 3,000,000 acres.
One result of the work on wheat varieties has been a striking improvement in the varietal purity of the crops.

520. BOERGER, A. 633.11:575(8)
Angewandte Genetik als entscheidender Faktor für das Vordringen des Weizenbaues im subtropischen Osten Südamerikas. (**Applied genetics as a decisive factor in the advancement of wheat cultivation in subtropical South America**).
Proc. 7th Int. Genet. Congr. Edinburgh 23–30 August, 1939 (1941) : 72–73. (Abst.)
Wheat is grown in South America from latitude 40° S. in Argentina to latitude 10° S. in the Uplands of the northern states of Brazil. The conditions under which the crop grows, particularly in south Brazil and Uruguay, are considered in relation to breeding new varieties. In the state Rio Grande do Sul (south Brazil) the work is based on the two Uruguayan varieties, "Centenario" and "Porvenir" (see "Plant Breeding Abstracts", Vol. VIII, Abst. 1486) and crosses between "Fronteira" and "Centenario" are very promising. Attempts to obtain forms resistant to yellow rust are being made. In La Estanzuela (Uruguay) *Ustilago* resistance is important and the variety "Litoral" (see "Plant Breeding Abstracts", Vol. VIII, Abst. 1487) is practically immune. In Uruguay also there is a very prolonged sowing time (from May to August). Severe damage may be caused by the aphid *Toxoptera graminum* and foot-rot is also important.

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* See also Absts 503 and 505.

521. Wenholz, H.,
Pridham, J. T.,
Vears, C. K., and
Curteis, W. M. 633.11:575(94)
**Wheat varieties in Australia. Purple straw. Important influence on Australian wheat-growing.**
Agric. Gaz. N.S.W. 1940 : **51** : 605–10.

Continuing this serial article (cf. "Plant Breeding Abstracts", Vol. XI, Abst. 17) brief notes are given on varieties in alphabetical order from Ogilvie to Puseas. Special mention is made of the variety Purple Straw (introduced into Australia from England in about 1850). Purple Straw is a representative of the squarehead type and was very widely grown until Farrer produced his Federation wheat in 1900. It enters into the parentage of Federation and other Australian varieties. Pusa 4, introduced from India, in 1916 is also an important variety in Australia.

522. Hackwell, A. B. and
McKeon, B. F. 633.11:575(94.5)
**Wimmera wheat tests. Trials at Longerenong.**
J. Dep. Agric. Vict. 1941 : **39** : 1–8.

Accounts are given of prominent wheat varieties in the Wimmera district. Ghurka has been the principal wheat grown in this district for many years. Two new promising varieties are Ghurka x C.M.G.5543 and Magnet (formerly known as Major x Free Gallipoli). Both these varieties outyield Ghurka.

523. 633.11:575:576.354.4
Love, R. M. 633.11:575.24:576.356
**The role of cytology in wheat improvement.**
Proc. 7th Int. Genet. Congr. Edinburgh 23–30 August, 1939 (1941) : p. 197. (Abst.)

The application of cytology to wheat improvement is considered under two headings, the study of hybrid material and the origin of off-types. The meiotic stability of new varieties of hybrid origin has been studied by determining the frequencies of micronuclei in young pollen tetrads. Fifteen per cent. of the *vulgare*-like rust-resistant plants of $F_5$, $F_6$ and $F_7$ generations from pentaploids showed irregularities in chromosome behaviour due to rearrangements of chromosome segments having taken place. Studies of meiosis in $F_1$ hybrids (15 pentaploids and 14 hexaploids) have shown specific differences in the arrangement of chromosome segments in the parents. Great difficulty is found in maintaining pure-breeding strains of Dawson's Golden Chaff winter wheat, the most notable off-type being a form with white chaff. Cytogenetic studies have shown that most (if not all) off-types owe their origin to losses of chromosome segments or even whole chromosomes. Plants phenotypically indistinguishable from the normal but which gave rise to off-types in later generations were also detected by cytological investigations.

524. Åkerman, Å. 633.11:575"793"(48.5)
**Spring-wheat breeding in Sweden.**
Proc. 7th Int. Genet. Congr. Edinburgh 23–30 August, 1939 (1941) : 46–47. (Abst.)

An account is given of the spring wheat breeding work in Sweden since its inception to the present position. The first progress was made by selecting from foreign varieties and these selections produced Svalöf's Pearl and Kolben. From crosses between these two, Svalöf's Extra-Kolben was selected. These varieties were much higher in yield than the Swedish land wheats. Success in obtaining earlier ripening spring wheats adapted to the interior and higher parts of the country was obtained by cross-breeding—the varieties Ruby and Diamond I originated from this work. The quality properties of Diamond I were raised by back-crossing it with Extra-Kolben II. Diamond II was selected from this back-cross. Finally it is pointed out that very complicated segregations are found in the progenies of crosses between spring and winter wheats.

525. Miège, E. 633.11:575.127.5:633.11 *Aegilops*:575.1:581.192
L'hérédité de la composition chimique chez les hybrides intergénériques. Étude de la descendance d'*Aegilops ovata* L. var. *nigra* x *Triticum vulgare* et d'*Aegilops ovata* x *Triticum durum* Desf. (**The inheritance of chemical composition in intergeneric hybrids. A study of the progeny of *Aegilops ovata* L. var. *nigra* x *Triticum vulgare* and of *Aegilops ovata* x *Triticum durum* Desf.**).
Proc. 7th Int. Genet. Congr. Edinburgh 23–30 August, 1939 (1941) : 219–20. (Abst.)

Morphological and anatomical studies of the progenies from the two intergeneric crosses showed that the $F_1$'s were intermediate between the parents, that from the $F_3$ generation onwards three types of lines, forms approaching both the *Aegilops* and *Triticum* parents and forms of the intermediate type, were obtained and that the lines approaching *Aegilops* were almost completely sterile whilst those of the types similar to the *Triticum* parent showed increasing fertility. Analyses for the following components of chemical composition, moisture content, dry matter, minerals, sugars, starch, fats, nitrogen and phosphorus, were made. The results showed that *Aegilops* and *Triticum* differ clearly in the chemical composition of their fruits, that the $F_1$ hybrids are intermediate and that from the $F_3$ onwards forms reverting to the parental types and lines maintaining their intermediate aspect are obtained. Sterility (sometimes total) is found in the lines approaching the *Aegilops* type but is rare in plants resembling the *Triticum* parent. It will thus be noted that the chemical results are similar to the morphological. For all the characters considered the *Aegilops* parent showed a preponderant influence. The *T. vulgare* hybrid lines approached more quickly the *Triticum* parent than the *T. durum* hybrids.

526. Peto, F. H. 633.11:575.127.5:633.289:576.312.35
**Cytology of *Triticum-Agropyron glaucum* backcrosses.**
Proc. 7th Int. Genet. Congr. Edinburgh 23–30 August, 1939 (1941) : 235–36. (Abst.)

Tetraploid and hexaploid *Triticum* species can be readily hybridized with *A. glaucum* ($2n = 42$). The $F_1$ hybrids are sterile but occasional seeds can be obtained by crossing them with pollen from *T. vulgare*, *T. durum* and *A. glaucum*. The chromosome numbers of the resulting plants closely approximate to those expected if an unreduced female gamete were fertilized by a normal haploid male gamete. It is suggested that the unreduced female gametes produced by the $F_1$ hybrids are formed by faulty cytokinesis at second division and not by restitution nuclei formed after first anaphase.

Three generations of the progeny of Mindum x *A. glaucum* and Lutescens x *A. glaucum* backcrossed to their respective wheat parents have also been examined cytologically. A plant of the first back-cross generation with Mindum as the wheat parent had a chromosome number of $2n = 49$ and formed at meiosis 8–11 bivalents and an occasional trivalent. Perennial plants in the later generations were found to have chromosome numbers of 49–53, no elimination of univalents having taken place. It appears likely that the univalents are mainly *Agropyron* chromosomes. It is these chromosomes which carry the genes for perennial habit.

527. 633.11:576.356.5:576.312.315
Pathak, G. N. 633.18:576.356.5
**Studies in the cytology of *Crocus* and cereals with special reference to satellites and nucleoli.**
Proc. 7th Int. Genet. Congr. Edinburgh 23–30 August, 1939 (1941) : 232–33. (Abst.)

Both *Triticum aegilopoides* and *T. monococcum* were found to possess two pairs of SAT-chromosomes. On the hypothesis that a true haploid complement has one satellite and one nucleolus, it is suggested that these two species are not true diploids. *Oryza Eichingeri*, a tetraploid rice with $2n = 48$, has eight nucleoli, probably corresponding to the same number of satellites, and it is therefore suggested that it is probably a secondary octaploid.

528. Gökğöl, M. 633.11:581.9:576.16
Zur Frage des Ursprungsgebietes der Weizen. (**On the question of the original home of the wheats**).
Proc. 7th Int. Genet. Congr. Edinburgh 23–30 August, 1939 (1941) : 130–31. (Abst.)

The author has investigated the variation found in wheat species and subspecies in Anatolia.

He suggests that Anatolia is the centre of origin of the diploid group and also of the tetraploid group (*dicoccum* and *durum*). He also points out that *Triticum dicoccoides* occurs in Anatolia and is not known from Abyssinia. *T. polonicum* and *T. turgidum* also occur in very many forms in Anatolia and it is suggested that they are derived from *T. durum*. In the hexaploid group, out of 270 *vulgare* forms 223 were found in Anatolia and out of 137 *compactum* forms 100 in Anatolia. The author, therefore, suggests that all the wheat species have had a single centre of origin in the Near East—Anatolia, Syria, Palestine, south Caucasus and those parts of Iran adjacent to Anatolia.

529. Crépin, C., Bustarret, J. and Chevalier, R. 633.11–2.451.3–1.521.6:575(44) 632.451.3:576.16
Création pour la France de blés résistants à la Carie. (**Creation for France of wheats resistant to bunt**).
Proc. 7th Int. Genet. Congr. Edinburgh 23–30 August, 1939 (1941) : 91–92. (Abst.)

The wheats cultivated in France are all susceptible to bunt (*Tilletia tritici*) and none of the resistant varieties at present known are suitable for cultivation there.
Bunts of French provenance either infect or fail to infect the varieties Baulmes and Magyarovar but infect neither Hussar nor Martin. Good results in the analysis of bunt collections have been obtained by using as infective material the produce of bunted ears threshed separately. The following generalizations have been established in regard to the inheritance of resistance to bunt: it is a mendelian character, not correlated with other characters. It is controlled by more than one factor, two factors in the case of Martin. Resistance to a given form may be controlled by different factors in different varieties and on the other hand, in the same variety resistance to different forms may be controlled by the same or different factors.
By crosses of resistant American or German varieties with susceptible French varieties resistant types have been obtained which are very nearly suitable for cultivation in France. They have been crossed again with French wheats or with wheats resistant to other forms of bunt. In the near future it will be possible to put into multiplication new varieties as productive as the French varieties at present cultivated and endowed with good resistance to most of the forms of bunt.

530. Philp, J. and Selim, A. G. 633.11–2.452–1.521.6:575(62)
**Rust-resistant wheats for Egypt.**
Nature, Lond., 1941 : **147** : p. 209.

Hindi (Egyptian wheats of Indian origin) and Egyptian wheats are highly susceptible to black rust. A moderately resistant *vulgare* variety, Mabrook, has been obtained from the cross Giza 7 (*vulgare*) x Beladi (*pyramidale*). As was the case in India (cf. "Plant Breeding Abstracts", Vol. X, Abst. 940) a promising degree of resistance to black rust has been found in a group of Kenya wheats. The cross U x 9M1A3 (Kenya) x Giza 7 has given lines which are almost completely resistant. U x 9M1A3 is of unknown origin and it probably obtained its rust resistance from a tetraploid parent. The lines from crosses between Egyptian and Kenya wheats are also high yielding and possess other desirable characters.

531. Frankel, O. H. 633.11:664.641.016:578.08:575
**Some reflexions on breeding wheat for baking quality.**
Proc. 7th Int. Genet. Congr. Edinburgh 23–30 August, 1939 (1941) : 122–23. (Abst.)

The substance of this paper has already been reviewed in "Plant Breeding Abstracts", Vol. X, Abst. 612.

532. Miczyński, K. 633.11 *Aegilops*:575.11
**The inheritance of some characters in the intervarietal crosses of *Aegilops*.**
Proc. 7th Int. Genet. Congr. Edinburgh 23–30 August, 1939 (1941) : p. 219. (Abst.)

$F_2$ segregations have been studied in intervarietal crosses in *A. ventricosa* and *A. triuncialis*. In *A. ventricosa* black glume colour is a simple dominant to red. In *A. triuncialis* absence of the waxy covering on ears and stems is dominant to the waxy condition and both 3 : 1 and

15 : 1 ratios for waxless: waxy were found in $F_2$ progenies. In this species also pubescent glume surface was found to be a simple dominant to glabrous glumes. The results suggested that the gene for pubescent *v* glabrous glumes is linked with one of the genes for waxless *v* waxy ears and stems. Several strains of *A. triuncialis* characterized by different mean lengths of the lateral glume awns were isolated. The crosses awnless x fully awned, awnless and awn-letted and short awned x fully awned showed in most $F_2$ segregations a distinct preponderance of the shorter awned parent.

## OATS 633.13

533. Stapledon, R. G. 633.13:575(42.9)
**The Welsh Plant Breeding Station.**
Country Life 1941 : **89** : 236–37.

*Inter alia*, the station's work on oat breeding is mentioned. Special attention is paid to resistance to lodging and recent productions include the white grained, spring oat S.84 and the winter oat S.172 with white grain and short, stiff straw.

534. Jones, E. T. 633.13:575.127.2:575.11:575.242
**A comparison of the segregation of wild versus cultivated base in the grain of diploid, tetraploid and hexaploid species of oats.**
Proc. 7th Int. Genet. Congr. Edinburgh 23–30 August, 1939 (1941) : 170–71. (Abst.)

Segregations for wild-type base *v.* cultivated type of base were studied in crosses between the diploid species *Avena Wiestii*, *A. hirtula* and one unnamed species called Cc 1795 (these three species have wild-type base) and two diploid species with cultivated type of base, *A. strigosa* and *brevis*. Wild-type base was fully dominant in $F_1$ and four phenotypic groups, wild type, cultivated and two new types, were found in the $F_2$. Crosses between the two new types give wild-type base. In three of the four crosses there was a significant deviation in the $F_2$ from the expected numbers for independent dihybrid segregation. This is probably due to sterility caused by structure differences in the chromosomes (see Abst. 535 below).

In the tetraploid cross *A. barbata* x *A. abyssinica* dominance of wild over cultivated base occurs in the $F_1$. Four phenotypic groups appear in the $F_2$ in proportions corresponding closely with a four factor segregation. In the hexaploid cross, *A. fatua* with wild-type base x *A. sativa* with cultivated type of base, however, cultivated type of base is nearly completely dominant to wild-type in the $F_1$ and segregation in the $F_2$ is monofactorial. Also, unlike segregates in the diploid and tetraploid crosses, the wild-type base is invariably associated with strong, geniculate awn. These results suggest that the cultivated hexaploid possesses a new gene (or gene arrangement) which differs from that determining cultivated base in the diploid and tetraploid groups. This new gene inhibits the development of the wild-type base and is linked with a gene which inhibits awn development. Series A fatuoids in cultivated hexaploids are due to a mutational change or deletion of the inhibiting genes.

535. Ellison, W. 633.13:576.356:575.12
**The cytology of certain diploid and tetraploid *Avena* hybrids.**
Proc. 7th Int. Genet. Congr. Edinburgh 23–30 August, 1939 (1941) : 109–10. (Abst.)

A ring of four chromosomes was observed at meiosis in the hybrid between Cc 1795 (an unidentified diploid species) and *A. Wiestii* and also in a hybrid between two segregates from this cross (see also "Plant Breeding Abstracts", Vol. IX, Abst. 37). Giant pollen mother cells with 14, 21 and 28 or even more bivalents are found in the anthers of some plants of Cc 1795. Meiosis was normal and seven bivalents were regularly formed in the hybrids obtained by intercrossing any of the diploid species, *A. brevis*, *Wiestii*, *strigosa* and *strigosa* subsp. *hirtula*.

## MAIZE 633.15

536. Tavčar, A. 633.15:575.11:581.44
**Inheritance of 2-, 3-, 4- and 6-articulate leaf whorls in *Zea Mays* L.**
Proc. 7th Int. Genet. Congr. Edinburgh 23–30 August, 1939 (1941) : 280–81. (Abst.)

Normal maize plants have alternate leaves with a divergence of 1/2. A single decussate plant was found in an $F_2$ progeny and the phyllotaxes of its progenies have been studied. It was not possible to produce a line breeding true for decussate leaf arrangement. Selfing decussate

plants produced an average of 13·72% of decussate plants, 0·57% of 3-articulate, 0·06% of 4-articulate, 0·001% of 6-articulate leaf whorl plants and 6·06% of plants intermediate between the normal alternate type and the abnormal types. Selfing the plants with 3-, 4- and 6-articulate leaf whorls produced progenies very similar to those from selfing decussate plants. Crosses of decussate with normal plants gave in the $F_1$ 8·14% decussate and 0·23% of 3-articulate whorls. Plants with normal phyllotaxis produced progenies in which all the plants were normal. There were also observed plants in which the main stem carried decussate leaves while the accessory stems had normal phyllotaxis. It is suggested that decussate plants and the other types with abnormal phyllotaxis are produced by the mutation of one unstable gene, the genes for the different types of leaf arrangement being multiple allelomorphs and mutating from one to the other. The following symbols are proposed: normal insertion *In*, decussate $In^{dec}$, 3-articulate $In^{tr}$, 4-articulate $In^{q}$ and 6-articulate $In^{s}$.

537. Lindstrom, E. W. 633.15:575.125:575.14:575(73)

**Analysis of modern maize breeding principles and methods.**

Proc. 7th Int. Genet. Congr. Edinburgh 23–30 August, 1939 (1941) : 191–96.

It is pointed out that the newer maize breeding methods, comprising inbreeding plus controlled heterosis, which are being utilized on so vast a scale in the U.S.A., afford an unusual case of the integration of theoretical and applied genetics. It is estimated that the total number of original selfed lines continued for 1–3 years in the various states is 27,641 and that only 677 (2·4%) were saved as useful inbreds. These selected inbreds have an average yield of about 30% of their hybrids. In addition to their poor yielding ability every inbred was deficient in one or more characters. No inbred in the 30,000 lines approached in any way the mean yield and vigour of the parental varieties. It is suggested that this is due to either a very large number of yield genes, or to the binding effects of environment in the selection programme, or a complex and intricate interaction of genes, or to a failure in the method of isolating such lines. Probably all four factors are at work plus others as yet unrecognized.

The possibility that the poor quality and yield of inbred lines of maize can be traced to the system of inbreeding has been investigated by an experiment which was inaugurated 10 years ago and is still unfinished. Some preliminary results are given in the present paper. Four systems of inbreeding, using both sib mating and self-fertilization, which gave different intensities of homozygosity at different stages, have been used. Phenotypically the progenies of mating system 4, in which sib mating, the milder form of inbreeding, is used in the first years, are slightly superior in vigour and size of ear. It is suggested that milder inbreeding at the beginning of a line would not only prevent too rapid a fixation of deleterious characters but would also provide a broader base for selection under more diverse environmental conditions. Details are also given of "a long-time programme to synthesize the corn species from first-cycle lines (those produced by self-fertilization from varieties)". "Second-cycle lines" have been obtained by back-crossing once or twice to the first-cycle inbred, followed by five to six generations of inbreeding (including sibbing and, later, selfing). By these methods forty second-cycle lines, which are superior to their progenitors in vegetative vigour, pollen production under drought conditions, lodging resistance and disease resistance, have been obtained. The yields of topcrosses also suggest that these second-cycle lines have retained the valuable yield genes found in the first-cycle lines. A start has also been made in the production of third-cycle lines.

Finally the author discusses work on the high degrees of physiological individuality, marked differences in root systems and striking differences in resistance to diseases possessed by maize inbred lines and he also considers the genetic problem of heterosis.

538. Rhoades, M. M. 633.15:575.242:575.113

**On the high mutation rate of the $a_1$ allele in maize induced by the *Dt* gene.**

Proc. 7th Int. Genet. Congr. Edinburgh 23–30 August, 1939 (1941 : 247–48. (Abst.)

A further account is given of the dominant gene *Dt* which causes the mutation of $a_1$ to $A_1$ to occur in all parts of the plant (for a previous account, see "Plant Breeding Abstracts", Vol. VIII, Abst. 1533). In the aleurone layer the number of times a given allele is present may be varied from one to three. The frequency of mutation of $a_1$ was found to be in a linear relation to the dosage of $a_1$. For the *Dt* gene, it was found that the frequency of mutation of $a_1$ was three times and about eighteen times as frequent for two doses and three doses respectively

as that found when it is present in one dose. *Dt* is in chromosome 9 and $a_1$ in chromosome 3. Cytological examinations did not show any chromosomal abnormalities which could be related to the effects of *Dt* on $a_1$. A dominant modifier, *M*, which inhibits the effect of *Dt* on $a_1$ has been isolated and a recessive gene which affects the time of mutation is also known. Another recessive which completely inhibits the effect of *Dt* has also been found. It is suggested that the *Dt* gene may produce some physiological condition in the cell which is conducive to the mutability of $a_1$.

539. Jones, D. F. 633.15:576.353:575.24:537.531
**Segmental exchange in somatic cells of maize.**
Proc. 7th Int. Genet. Congr. Edinburgh 23–30 August, 1939 (1941) : p. 170. (Abst.)

Mosaic areas due to deletions and translocations in somatic mitoses are found in the endosperm of maize seeds. Three marker genes on different chromosomes, *C* and *Pr* controlling aleurone colour and *Su* which differentiates between starchy and sugary endosperm, were used in the experiments. The number and ratio of mosaics involving one and two chromosome markers in untreated controls and in X-rayed material are given. The results show that there is a more or less random exchange among all the chromosomes in untreated as well as in treated material and that the proportion of mosaics involving two marked chromosomes compared to those that involve one marked chromosome only is greatly increased by the X-ray treatment.

## BARLEY 633.16

540. Bell, G. D. H. and Carson, G. P. 633.16:575.11:581.46
**The inheritance of rachilla length in barley.**
J. Agric. Sci. 1941 : **31** : 246–79.

Two types of rachilla can be distinguished in barley—the "Archer" and "Chevallier" types. Rachilla length also varies with the variety and in the same variety with position of the grains, whether median or lateral in a six-row barley and also whether borne at the base, middle or apex of an ear. Significant differences between rachilla lengths of the same variety in two different years were also found. The $F_1$ of the cross *H. parallelum* (short, Archer-type rachilla) x Irish six-row (long, Chevallier-type rachilla) had Archer type rachillas with a mean length greater than that of Irish six-row. In the $F_2$ generation the Archer-type segregates had rachillas with a mean length of 3·69 mm. as compared with 3·48 mm. in the Archer-type parent and the Chevallier-type segregates had rachillas of mean length 4·12 mm. as compared with 2·77 mm. in Irish six-row. On the other hand, the whole $F_2$ showed a unimodal frequency with a mean rachilla length of 3·80 mm. which is almost identical with that of the longer parent. The cross *H. parallelum* x Bigo (long, Chevallier-type rachilla) differed from the previous cross in that the rachilla lengths of the $F_1$ and of the Chevallier-type segregates in the $F_2$ were not greater than that of the long rachilla parent. It is next pointed out that for different varieties there is a high correlation between internode and rachilla lengths. Two other six-row $F_1$ hybrids of the type short, Chevallier-type rachilla x longer, Archer-type rachilla had significantly longer rachillas than those found in the long rachilla parent. Finally the inheritance of rachilla length was studied in a number of crosses between two-row varieties, all of which were lax ear forms with Archer-type rachillas. In crosses of the type long x short rachilla the $F_1$ hybrids had rachillas of intermediate lengths. In the one cross of the type long x long rachilla the $F_1$ was also intermediate but in a short x short rachilla cross the $F_1$ had significantly longer rachillas than either parent. The $F_2$ generation of a long x short rachilla cross suggested that the inheritance of rachilla length can be explained on a system of multiple factors, probably of not more than four major ones, of simple additive nature. An $F_3$ generation of 20 families from plants selected from the tails of the $F_2$ generation was grown. Some $F_3$ lines were homozygous for mean rachilla lengths equal to the parental means. In neither the $F_2$ nor the $F_3$ was there any suggestion of transgressive segregation.

541. Robertson, D. W. 633.16:575.116.4
**Studies of barley genetics in Colorado.**
Proc. 7th Int. Genet. Congr. Edinburgh 23–30 August, 1939 (1941) : p. 252. (Abst.)

Details are given of a number of factor pairs which have been placed in seven linkage groups. Another factor pair for chlorina seedlings found in Coast 5 was found to be inherited maternally.

542. Thomson, W. P. 633.16:575.127.5:633.14:581.48
**The frequency of fertilization and the nature of embryo and endosperm development in intergeneric crosses in cereals.**
Proc. 7th Int. Genet. Congr. Edinburgh 23 30 August, 1939 (1941) : p. 281. (Abst.)

Fertilization and embryo and endosperm development were examined in the following intergeneric crosses: *Hordeum* x *Secale*, *Triticum* x *Secale* and *Triticum* x *Agropyron*. Details are given in this abstract of one cross only, a certain variety of barley pollinated by rye. Fertilization took place in more than 90% of the ovaries; embryos developed normally up to 4 days but died and began to disintegrate at about 8 days; and the endosperm never formed cells and also died early. In other crosses there was complete failure of fertilization.

## MILLETS AND SORGHUM 633.17

543. Rangaswami Ayyangar, G. N. and Srinivasa Rao, U. L. 633.171:575.11
**Studies in the Barnyard millet—*Echinochloa colona* var. *frumentacea*, C. E. C. Fischer.**
Madras Agric. J. 1941 : **29** : 3–12.

The agricultural value and the systematics of the plant are briefly reviewed. Anthesis is described. Four grades of anthocyanin pigmentation are recognized and these were found to be governed by two factors segregating independently and without complete dominance. The characters of the spike are described in some detail; three types are recognized, open, compact and intermediate. A case of male sterility was found and the condition was inherited as a monogenic recessive. A plant with albino striping was found. Progenies from white and green tillers gave green and pale seedlings in different ratios, the ratios being about the same from green as from white tillers.

544. Krishnaswamy, N. and Rangaswami Ayyangar, G. N. 633.171:576.356.5:576.354.4
**An autotriploid in the pearl millet (*Pennisetum typhoides* S. & H.!)**
Proc. Indian Acad. Sci. 1941 : **13** : Sect. B : 9–23.

An autotriploid ($2n = 21$) was found in the progeny of a sterile diploid plant ($2n = 14$) of pearl millet. Three nucleoli were observed in the resting nuclei of the triploid. At meiosis the triploid forms an average of 4·95 trivalents per cell. A few abnormalities of pairing, e.g. a chain of ten chromosomes, were also observed in some cells. At both first and second anaphases bridges were seen.

545. Rangaswami Ayyangar, G. N. and Sankara Ayyar, M. A. 633.174:575.116.1
**The inheritance and linkage affinities of the yellow coloured midrib in sorghum.**
Curr. Sci. 1940 : **9** : 542–43.

Yellow colour in the midrib is found in many types of sorghum and is due to the presence of a carotinoid pigment in the sclerenchymatous tissues at the upper and lower surfaces of the midrib. Its inheritance was studied in crosses between A.S.3897 (yellow midrib, pithy stem and blackish purple leaf-sheath) and A.S.3835 (dull green midrib, juicy stem and reddish purple leaf-sheath). Yellow midrib was found to be due to a single dominant gene which has been given its symbol, $Y^{md}$. $Y^{md}$ is linked with *Q* (the gene for reddish purple leaf-sheath), the cross-over value being 35·5%, but is not linked with *D* (the gene for pithy stalk).

## RICE 633.18*

546. Birkinshaw, F. 633.18:575(91)
**A review of field experiments on padi in Malaya.**
Malay Agric. J. 1940 : **28** : 507–16.

One section of this paper deals with padi selection, yield trials and the distribution of pure strains. Details are given of the value of the following selected strains—Pulau Gadong strains Siam 39 and 29, Titi Serong strains Seraup 36, 48 and 371—and of strains of Mayang Sa'Batil. The methods of selection are also discussed.

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* See also Abst. 502.

547. Birkinshaw, F. 633.18:575(91)
**A review of field experiments on padi in Malaya.**
Malay. Agric. J. 1941 : **29** : 3–43.
An account is given of the selection work and the testing of varieties at the many padi research stations in Malaya. The accounts have been contributed by Departmental Officers in the various States and Settlements. There are reports from nine stations in Kedah, from three in Penang and Province Wellesley, from ten in Perak, from two in Selangor, from three in Negri Sembilan, from three in Malacca, from nine in Pahang, from four in Kelantan, from three in Johore, from four in Brunei and finally from one small station in Labuan. This paper is distinct from that of the preceding abstract.

548. 633.18–1.524(59.2)
**Rice.**
Dept. Agric. Burma, Markets Sect. Surv. 1941 : No. 9 : Pp. 112.
In this survey Chapter III consists of a classification and short descriptions of Burma rice varieties and Chapter XII describes the work of the Agricultural Department in distributing seed and in selecting pure strains. A list of the chief pure strains is given.

549. 633.18–2.484–1.521.6:575
633.18:575.243:537.531
**Blast-resistant rice.**
Indian Fmg 1941 : **2** : p. 33.
In Madras new strains and selections are tested every year for resistance to blast (*Piricularia oryzae*) by the Mycologist. The Paddy Specialist has evolved by hybridization strains combining resistance with some of the desirable yield and grain characteristics of the susceptible parent. Thus from a cross between G.E.B. 24 (resistant) and Adt 10 (susceptible) the strains 10998, 11340, 11348 and 5170 have been bred and are proving popular in the blast-affected areas.
X-ray induced mutants of G.E.B. 24 include some with improved tillering and straw which is more palatable to cattle.

## FORAGE GRASSES 633.2

550. Olah, L. 633.24:575.127.2:576.356.5
**Interspecific hybrids in the genus *Phleum*.**
Proc. 7th Int. Genet. Congr. Edinburgh 23–30 August, 1939 (1941) : p. 228. (Abst.)
Cytological investigations of the progeny of the hybrids *P. pratense* ($2n = 42$) x *P. alpinum* ($2n = 28$) and *P. pratense* var. *nodosum* ($2n = 14$) x *P. alpinum* ($2n = 28$) were made. One fertile plant, which was derived from a hybrid with 21 chromosomes, had a chromosome number of $2n = 42$ and another very sterile and feeble plant had 56 chromosomes. It is suggested that the fertile plant is an amphidiploid and that octaploidy is the highest polyploid form in *Phleum* which is viable.

551. 633.263:575.127.2:576.12
633.264:575.127.2:576.12
Jenkin, T. J. 633.263:575.127.5:633.264
**Evolution in wild populations.**
Proc. 7th Int. Genet. Congr. Edinburgh 23–30 August, 1939 (1941) : 167–68. (Abst.)
Populations of *Lolium perenne* have been extensively studied and show distinct tendencies to mass divergence of type under different environmental conditions. Considerable variations in type have also been found in other *Lolium* species. These intraspecific variations are usually distinct from the interspecific differences. All *Lolium* species are diploids.
The genus *Festuca* includes two main classes—the fine-leaved (Ovinae) and the broad-leaved (Bovinae) types. Polyploid series are found in both sections of the genus. Interspecific crosses have been successfully made within each of the two classes and also between representatives of the two classes. Thus a general phylogenetic relationship for the whole of the genus *Festuca* is indicated, although the extreme types in this genus have few morphological characters in common.

Crosses can also be made between the two genera, *Lolium* and *Festuca*. Thus *L. perenne* can be crossed with members of both the Ovinae and Bovinae sections of *Festuca*. Also *L. loliaceum* has been successfully intercrossed with *F. capillata* (a diploid of the Ovinae group) and with *F. arundinacea* (a hexaploid of the Bovinae group). These crossing experiments suggest that the two genera, *Lolium* and *Festuca*, are related and probably derived from a common prototype.

## LEGUMINOUS FORAGE PLANTS 633.3

552. WILLIAMS, R. D. 633.321:581.162.5:575.113:575.116

**Incompatibility alleles in *Trifolium pratense* L.; their frequency and linkage relationships.**

Proc. 7th Int. Genet. Congr. Edinburgh 23-30 August, 1939 (1941) : p. 316. (Abst.)

Self- and cross-incompatibility in red clover (*T. pratense*), which is a diploid species with $n = 7$, are determined by a single series of oppositional factors. In a random sample of twenty-four plants of English late variety and twenty plants of English broad red variety, there were found 41 and 37 *S* alleles respectively. The majority of these *S* alleles appear to be fully incompatible when present in both pollen and pistils, while others are less incompatible in so far as they can effect pseudo-fertilization under certain conditions. Self-compatible plants carrying the completely dominant $S^f$ allele are very rare. Two of the three fully self-fertile plants isolated are known to have appeared as mutations. The *S* alleles, which are located in linkage group 2, have been shown to be linked with two factors for flower colour and seven factors for chlorophyll deficiency. Linkage studies have also confirmed the fact that the fertility factor $S^f$, belongs to the same allelomorphic series as the incompatibility factors, $S^1$, $S^2$, etc.

553. 633.374:576.356.5:575.11:581.6

DAWSON, C. D. R. 633.37:581.162.52

**Tetrasomic inheritance in *Lotus corniculatus* L.**

J. Genet. 1941 : **42** : 49–72.

Some plants of *L. corniculatus* are cyanogenetic and some are not. Tetrasomic ratios were obtained in the progeny of controlled crosses, which could be made without emasculation because of the high degree of self-sterility of this plant. A single dominant gene determines cyanogenesis in the plant studied genetically, which segregated sharply. Other plants were found which gave off only traces of HCN and this condition may be due to minor factors. The following species of *Lotus* are known in the British Isles: *L. tenuis* ($2n = 12$), perennial, rather rare; *L. uliginosus* ($2n = 12$), perennial, widespread; *L. corniculatus* ($2n = 24$), perennial, very common; *L. angustissimus* ($2n = 12$), annual, rare; *L. hispidus* ($2n = 24$), annual, rare. *L. corniculatus* and *L. tenuis* contain both cyanogenetic and acyanogenetic individuals, while the other three species have never been found to be cyanogenetic. *L. corniculatus* differs from *L. tenuis* in the same way as an autotetraploid differs from the corresponding diploid. In view of this and the genetical evidence, it is suggested that *L. corniculatus* is an autotetraploid derived from *L. tenuis* or a common ancestor, little weight being attached to the fact that *L. corniculatus* forms only an occasional quadrivalent at meiosis.

## ROOTS AND TUBERS 633.4

554. LAMM, R. 633.491:575.127.2:576.356:575.182

**Varying cytological behaviour in reciprocal *Solanum* crosses.**

Proc. 7th Int. Genet. Congr. Edinburgh 23–30 August, 1939 (1941) : p. 179. (Abst.)

The cross pentaploid *S. curtilobum* female x tetraploid *S. tuberosum* can be easily made and fertile hybrids with chromosome numbers intermediate between those of the two parents are obtained. The reciprocal cross is difficult to make but it has been carried out by grafting the female parent, *S. tuberosum*, on tomato. The hybrids produced also have intermediate chromosome numbers but they are totally sterile. Meiosis in the hybrids with *S. curtilobum* as female parent takes place normally and in a manner similar to that found in the parents. In the hybrids with *S. tuberosum* as female parent only univalents occur at metaphase and dyads are formed. The nuclei of the dyads generally degenerate. These differences between reciprocal hybrids may be due either to cytoplasmic inheritance or to maternal effects.

555. 633.491:576.16(54)
633.491:575(54)

**Report on the marketing of potatoes in India and Burma.**
Agric. Market. India 1941 : Market. Ser. No. 22 : Pp. 332.

In this report there are two sections of possible interest to potato breeders—pages 10–16, "area under different varieties" and Chapter XIII, "Research". The varieties grown include introduced European varieties and *Desi* varieties which cannot be identified with known European ones. In Chapter XIII there is some small mention of plant breeding.

556. 633.491–2.411.4–1.521.6:575.127.2
SALAMAN, R. N. 632.411.4:576.16

**Breeding for immunity to blight and other diseases in the potato.**
Proc. 7th Int. Genet. Congr. Edinburgh 23–30 August, 1939 (1941) : 253–54. (Abst.)

This is a brief account of the work of Salaman and others at Cambridge on breeding *Phytophthora* resistant potatoes. Varieties which combined resistance to the common form of *P. infestans* with desirable economic characters, were obtained from crosses between cultivated varieties and *Solanum demissum* by back-crossing and selfing. These "single resisters" are, however, not resistant to another biotype of the fungus. "Double resisters", which are resistant to both *Phytophthora* biotypes, have now been obtained but they do not possess all the desirable economic qualities of the domestic varieties.

557. MÜLLER, K. O. 633.491–2.411.4–1.521.6:581.01

Physiologisch-genetische Untersuchungen zur Analyse der *Phytophthora*-Resistenz der Kartoffel. (**Physiological-genetical investigations on the analysis of *Phytophthora* resistance of potatoes**).
Proc. 7th Int. Genet. Congr. Edinburgh 23–30 August, 1939 (1941) : 222–23. (Abst.)

From crosses between South American potatoes which have a high degree of resistance to *Phytophthora* and cultivated varieties there have been obtained the "W-varieties" which combine economic characters with resistance to the A group of *Phytophthora* biotypes. The genetics of this resistance can be understood when it is realized that the cultivated varieties are tetraploids. The mechanism of the disease resistance has been investigated and it has been found to be not due to any initial resistance to the growth of the parasite. The parasite is able to infect the cells of resistant types and these are killed. Before the death of the cells, however, a toxic substance, which belongs to the tannins, is produced and this substance hinders the development of the fungus. The substance is also toxic to other micro-organisms. Susceptible varieties also produce this toxic substance but at too late a stage to stop the complete development of the fungus. The "resistance" genes thus produce no "all or none" reaction but function only as accelerators of the reaction of the host to the parasite. By keeping tubers of susceptible varieties at 3–6° C. the development of the fungus is very slow and the "defence necrosis" of the potato relatively rapid. The parasite thus does not develop and the susceptible tubers behave as resistant (cf. "Plant Breeding Abstracts", Vol. XI, Abst. 161).

## FIBRES 633.5*

558. 633.51:575(54.8)

**Two new Cambodia strains.**
Indian Fmg 1941 : **2** : p. 83.

The Cambodia strain, Co 2, which suffers from the disadvantage of being long in duration, was crossed with two early maturing South African strains, U 4/4 and A 12. Two new strains, Co 3 and Co 4, which are about three weeks earlier than Co 2, with heavier yield than Co 2 and which have lint superior to that of Co 2, have been isolated from the progenies of these crosses.

559. HARLAND, S. C. and
ATTECK, O. M. 633.51:575.115

**The genetics of cotton. XIX. Normal alleles of the crinkled mutant of *Gossypium barbadense* L. differing in dominance potency, and an experimental verification of Fisher's theory of dominance.**
J. Genet. 1941 : **42** : 21–47.

The materials used consisted of the original strain of *G. barbadense* (Sea Island) crinkled, three

* See also Abst. 502 (Cotton).

*hirsutum* crinkleds (containing the original *barbadense* mutant gene), Grade 1 super-crinkled selected from the cross *barbadense* crinkled x *hirsutum* crinkled, five types of normal *G. hirsutum*, two types of *G. purpurascens* normal (including the wild variety *Morilli*), *G. Taitense*, *G. Darwinii* and *G. tomentosum*.

By the back-cross method the dominance potencies of the normal allelomorphs of crinkled from the different forms were studied in different genetic backgrounds. It was found that *G. hirsutum*, *purpurascens* and *Taitense* have normal allelomorphs of relatively weak dominance potency, while *barbadense*, *tomentosum* and *Darwinii* have strong normal allelomorphs. In the former group of species dominance has been reached by the selection of modifiers affecting the heterozygous phase and also, it is argued, the recessive. In the latter group dominance is attained by the employment of a strong normal allelomorph and the recessive phase is relatively unmodified.

*G. hirsutum* type 9, a pure line of the commercial variety Meade, has a normal allelomorph ($C^{RM}$) which is weaker than those of the other *hirsutum* types studied ($C^{RH}$).

There is some evidence that the *barbadense* normal allelomorph ($C^{RB}$) becomes mutable on the background of one type of *G. purpurascens*.

560. Ranganatha Rao, V. N. 633.51:575.127.2:575

**Hybridization between two hybrids.**

Proc. 7th Int. Genet. Congr. Edinburgh 23–30 August, 1939 (1941): 244–45. (Abst.)

By crossing the interspecific hybrid *Gossypium arboreum* x *G. herbaceum* with the intervarietal hybrid *G. cernuum* x *G. obtusifolium* it has been possible to obtain very promising strains which combine the long silky staple of *arboreum* with long big bolls and high ginning out-turn.

561. Harland, S. C. and Atteck, O. M. 633.51:575.127.2:575.11 633.51:575.129

**The genetics of cotton. XVIII. Transference of genes from diploid North American wild cottons (*Gossypium Thurberi*, Tod., *G. Armourianum* Kearney, and *G. aridum* comb. nov. Skovsted) to tetraploid new world cottons (*G. barbadense* L. and *G. hirsutum* L.).**

J. Genet. 1941 : **42** : 1–19.

By the back-cross method genes were transferred from the diploid ($2n = 26$) North American species *G. Thurberi*, *G. Armourianum* and *G. aridum* to the tetraploid New World species *G. barbadense* and *G. hirsutum*.

The diploid species were each found to carry a normal allelomorph of crinkled. The normal allelomorph of *G. Thurberi* has a weak dominance potency and corresponds to that found in *G. hirsutum* while *G. Armourianum* has a normal allelomorph of strong dominance potency and corresponds to that of *G. barbadense*. *G. aridum* has a normal allelomorph of less potency than that of *G. Armourianum*.

The *G. Armourianum* petal spot gene, $S^{ARM}$, proved to occupy the same locus as $R^H$ (*hirsutum* red). Its effect was not reduced on a *G. hirsutum* background and on a *G. barbadense* background the petal spot was increased in size and intensity.

The anthocyanin colour complex of *G. aridum* (large petal spot, coloured filaments and flush in the petals) is determined by the gene $S^{ARI}$, which proved to occupy the same locus as $R^H$ and $S^{ARM}$. In the third and subsequent back-crosses to *hirsutum* this gene became mutable. Of the two types of mutation observed the more common caused the disappearance of the petal spot and colour in the filaments, leaving the petal flush; more rarely the petal flush disappeared leaving the spot and the colour in the filaments.

The $R^A$ gene of Asiatic diploids has already been shown to occupy the locus of the $R^B$–$S^B$ multiple allelomorph series and the above results are therefore taken as conclusive genetical proof of the theory advanced on cytological grounds that the tetraploid New World cottons contain two $n = 13$ genoms of Asiatic and North American origin respectively.

562. Harland, S. C. 633.51:576.16:575.1

**Genetical studies in the genus *Gossypium* and their relationship to evolutionary and taxonomic problems.**

Proc. 7th Int. Genet. Congr. Edinburgh 23–30 August, 1939 (1941) : 138–43.

The author discusses his own work on *Gossypium* in relation to evolution in this genus. Most of this work has been previously abstracted in "Plant Breeding Abstracts" (see particularly Vol. VI, Abst. 715). It is suggested that the study of species differences largely resolves

itself into a study of the genetical backgrounds or modifier complexes and how they are built up. The evolutionary history of the New World $n = 26$ cottons is considered and it has been shown both by cytological and genetical methods that these forms are allotetraploids, containing two 13-chromosome genoms of Asiatic and American origin respectively. The genic effects of long isolation are next discussed. Crosses between *G. hirsutum* and *G. barbadense* are considered in detail and reference is also made to crosses between other New World species. The chief character studied in these crosses was "petal spot". The results showed that the first genetical effect of geographical isolations is that homologous characters become built up in different ways—three main types of construction, a strong gene with few or no modifiers, a weak key gene accompanied by plus modifiers and an association of modifiers with no key gene, are recognized. The mutant type known as Crinkled Dwarf is next considered, especially with respect to modifying factors which affect the phenotypic appearance and survival value of the crinkled plants. Finally the value of genetical experiments for the elucidation of taxonomical relationships is stressed.

563. Jacob, K. T. 633.51:576.353:576.356
**Certain abnormalities in the root tips of cotton.**
Curr. Sci. 1941 : **10** : 174–75.

Ring chromosomes, chromosomes with lateral satellites and cytomixis have been observed in root tip cells of various varieties of *Gossypium herbaceum.*

564. Camara, A. 633.526.2:576.356:537.531
**The effect of X-radiation on the chromosomes of *Aloë arborescens*.**
Proc. 7th Int. Genet. Congr. Edinburgh 23–30 August, 1939 (1941) : p. 83. (Abst.)

Flower buds of *A. arborescens* were treated with different intensities of X-rays. The results of measuring fragments near anaphase bridges suggested that parts of greater susceptibility to breakage occur in the chromosomes. A non-linear relation between number of breaks and X-ray intensities was found. The results also suggested that translocations arise as a consequence of breakages followed later by fusions.

565. 633.584.3:576.312.34:575.127.2
Wilkinson, J. 633.584.3:576.354.4
**The cytology of the cricket bat willow (*Salix alba* var. *caerulea*).**
Ann. Bot. Lond. 1941 : **5** : 149–65.

The somatic chromosome complements of *S. alba* and its varieties, of *S. fragilis* and of a number of selected hybrids and "unknowns" have been examined. *S. alba* and *S. fragilis* both have $2n = 76$ and the chromosome complements are similar. Most *S. alba* plants have four satellited chromosomes while the cricket bat willows (var. *caerulea*) appear to have only two. The hybrids studied (*S. viridis* var. *roystonensis*, *S. viridis* var. *eleyensis* and matroclinous and patroclinous *caerulea* x *Basfordiana* crosses) also had $2n = 76$ but their chromosome complements were different from those of *S. alba* and *S. fragilis* in the distribution of the chromosomes in the size classes. The identification of a number of "unknowns" is attempted from a study of their chromosome complements. Meiosis was studied in two plants of *S. caerulea*, in *S. fragilis* var. *Basfordiana* and in two individuals from a *caerulea-Basfordiana* cross. Occasional quadrivalents and univalents were observed in the hybrids.

## SUGAR PLANTS 633.6

566. Khushi Mohammad, Ch. 633.61:575
**A new heavy-yielding variety of sugarcane.**
Indian Fmg 1941 : **2** : 140–41.

A new variety of sugar cane, Co 421, is as high yielding as Co 312, the heaviest yielder in the Punjab, and unlike Co 312 the new variety is free from lodging on rich soils and is resistant to pyrilla attack. Co 421 also has a harder rind than Co 312 and is therefore not damaged so much by rats. It is a tall-growing variety and has a very good root system.

567. 633.61:575(54)
**Some practical results of sugarcane research in India.**
Misc. Bull. Imp. Coun. Agric. Res. New Delhi 1940 : No. 34 : Pp. 41.

In the first part of this bulletin an account is given of the varieties of sugar cane cultivated in India. This includes a list of the Coimbatore canes in general cultivation. There are short descriptions of these canes and of their agricultural characters.

568. Dodds, H. H. 633.61:575(68)
**Science in a primary food industry—the production of sugar.**
S. Afr. J. Sci. 1938 : **35** : 33–51.
In the course of this presidential address to the South African Association for the advancement of Science the speaker dealt with: varieties of sugar cane concerned in the early development of the industry; cane breeding in various countries; and the work of the Experiment Station of the South African Sugar Association at Mount Edgecombe.

569. Stevenson, G. C. 633.61:575(69.82)
**Part I—Cane breeding.**
10th Rep. Sug. Cane Res. Sta. Mauritius (1939) 1940 : 6–16.
An account is given of the breeding and testing of varieties and seedlings in sugar cane. The origin of the variety Uba Marot is being investigated and it is suggested that it may be the progeny of a natural cross between a noble cane and an Indian *S. spontaneum* which occurs wild in Mauritius. The cane M.134/32 demonstrated a remarkable resistance to cyclone damage in spite of its broad leaves and luxurious growth habit.

570. Janaki, E. K. 633.61:575.127:576.356.5
**Triplopolyploidy and the production of fertile intergeneric hybrids in *Saccharum*.**
Proc. 7th Int. Genet. Congr. Edinburgh 23–30 August, 1939 (1941) : 166–67. (Abst.)
The author points out that the production of diploid egg cells is very common in *Saccharum* and that "triplo-polyploids" therefore occur in interspecific and intergeneric crosses. The "triplo-polyploid" hybrids between *S. officinarum* and *S. spontaneum* are fertile and have yielded economically useful types of sugar canes. Several intergeneric hybrids are also mentioned (cf. "Plant Breeding Abstracts", Vol. XI, Abst. 286).

571. Janaki-Ammal, E. K. 633.61:576.354.4:576.356
**The breakdown of meiosis in a male-sterile *Saccharum*.**
Ann. Bot. Lond. 1941 : **5** : 83–87.
Meiosis is described in a male-sterile sugar cane seedling ($2n = 110$) which arose parthenogenetically when P.O.J.2725 ($2n = 106$) was pollinated by *Imperata cylindrica*. Meiosis is normal until first anaphase but after first telophase the spindle becomes inactive. The two nuclei formed then either move down the sides of the spindle or pass through it. A restitution nucleus may be formed. In rare cases tetrad and dyad grains are formed but these always degenerate.

572. Thuljaram Rao, J. and Venkatraman, T. S. 633.61–2.7–1.521.6:581.45
**Hard leaf mid-rib in sugarcanes and resistance to top-borer (*Scirpophaga nivella* F.)**
Curr. Sci. 1941 : **10** : 171–72.
A fairly high correlation has been found between the thickening of the various mid-rib tissues and the resistance of sugar cane varieties to top-borer attack.

573. McIntosh, A. E. S. 633.61–2.8–1.521.6(72.9)
**Report on a third visit to Jamaica.**
Bull. B.W.I. Cent. Sug. Cane Breed. Sta. 1940 : No. 22 : Pp. 17.
The importance of mosaic disease to the sugar cane industry in Jamaica is stressed. In an appendix there is given a list of 63 B. seedlings sent to Jamaica. The parentage, reaction to mosaic disease and notes on growth are given for each seedling. The scheme for testing seedlings received in Jamaica is also outlined. The seedling B.3439 has given exceptionally promising results. It is a noble cane but possesses a high degree of resistance to mosaic disease.

574. Finney, D. J. 633.63:519.24:631.421
**The relationship of plant number and yield in sugar-beet and mangolds.**
Emp. J. Exp. Agric. 1941 : **9** : 57–64.
The error regression of yield on plant number was calculated for 52 experiments in England in the years 1933–9. The experiments chosen were mostly those for which plant number showed great variability from plot to plot. The data suggest that for a normal yielding crop, and within reasonable limits of plant density, any loss of plants will result in a loss in yield of

about 50% of that which would occur if the remaining plants gave no compensatory increase in yield per plant. A Danish experiment on the influence of artificially produced gaps, another Danish experiment on the relation between yield and plant density and a Dutch experiment in which each root was weighed and the distance from the two adjacent roots in the same row was measured are analysed and the effect of plant number on yield for each of these experiments is shown to be similar to that found in the English experiments.

575. RASMUSSON, J. 633.63:575:633.00.14
**The field trials in sugar-beet breeding.**
Proc. 7th Int. Genet. Congr. Edinburgh 23–30 August, 1939 (1941) : p. 245. (Abst.)

It is pointed out that most breeding work aims at producing varieties which will give good yields when grown under very varying conditions. Also sugar beet, being a cross-fertilized crop, will generally react to breeding under specialized conditions by becoming markedly adapted to those conditions in a few generations and this is often followed by the unwanted result that the strain is not fit for other conditions. To counteract this tendency the breeder should take certain precautions in his field testing work. The field test should take into account the variations in soil and climate of the regions in which the variety will be grown. The author also varies sowing time, nitrogen fertilizing and harvesting time within each field experiment.

576. RASMUSSON, J. 633.63:575–18:575.42
**Quantitative inheritance in root crops.**
Proc. 7th Int. Genet. Congr. Edinburgh 23–30 August, 1939 (1940) : 245–46. (Abst.)

Inbreeding and outbreeding and correlations between different characters are considered in relation to the breeding of root crops, particularly sugar beet. It is pointed out that even slight inbreeding has decidedly bad effects on the vigour of root crops. Inbreeding is, however, useful for separating out special types, e.g. disease resistant strains. Several of the chemical characters which determine quality in root crops are usually found to be correlated with size of root and some of them are also often correlated with root shape. It is suggested that some of these correlations are due to linkages between genes and that such correlations caused by linkage are very effective for the purpose of selection. Thus selection for sugar content alone will decrease not only root size but also sugar yield much more than would be expected from the usual weak correlation found on analysing roots of any variety grown in a small area. Some of these correlations can be broken, probably because the linkage is not too strong.

## STIMULANTS 633.7

577. GISQUET, P.,
DUFRENOY, J. and
DUSSEAU, A. 633.71:575.127.2:576.354.4
**Interspecific hybrids among *Nicotiana* ; hybrids between *N. Tabacum* var. *purpurea* and *N. petunioides* var. *sylvestris*.**
Proc. 7th Int. Genet. Congr. Edinburgh 23–30 August, 1939 (1941) : p. 130. (Abst.)

Most of the information in this paper has been previously published (see "Plant Breeding Abstracts", Vol. X, Abst. 506). The only additional information given in the present communication appears to be that at meiosis in the $F_1$ hybrid *N. Tabacum* ($n = 24$) x *petunioides* ($n = 12$) a variable number of bivalents and univalents are formed. In some cells 18 bivalents were observed.

578. 633.71:576.356.5:581.04
BADENHUIZEN, N. P. 633.524.35:576.356.5:581.04
**Colchicine-induced tetraploids obtained from plants of economic value.**
Nature, Lond. 1941 : **147** : p. 577.

Tetraploids were obtained by seed treatment of Vorstenlanden and Virginia tobacco and by treatment of apical meristems of *Hibiscus cannabinus*. The tetraploid tobaccos were mostly of less commercial value than the diploids. Doubling the chromosomes produced less physiological changes in *Hibiscus* than in tobacco; this is attributed to the smaller chromosome number of the former.

## OIL PLANTS 633.85

579. Richharia, R. H. and
Persai, D. P. 633.853.74:576.356.5:581.04
**Tetraploid til (*Sesamum orientale* L.) from colchicine treatment.**
Curr. Sci. 1940 : **9** : p. 542.

Autotetraploids ($n = 26$) of *S. orientale* have been obtained by colchicine treatment; 0–5 quadrivalents were observed at meiosis.

580. Kumar, L. S. S. and
Ranga Rao, D. S. 633.853.74–1.557
**Studies in blooming in three Punjab types of sesamum in the Bombay Deccan.**
J. Univ. Bombay 1941 : **9** : Pt 5 : 69–77.

The number of flowers produced, the number of capsules set and the yield of three pure types of Punjab sesamum (*Sesamum indicum*) were studied. Type 26 (White) had nearly twice as many flowers as the other two types but had the least percentage of capsules set and produced the lowest yield. Type 22 (Black) had more flowers and set proportionately more capsules than Type 15 (Brown). Type 22 thus gave the highest yield.

581. Webster, C. C. 633.854.56:575
**A note on the yield of tung trees in Nyasaland.**
E. Afr. Agric. J. 1941 : **6** : 160–63.

The substance of the part of this article dealing with variation in yield and the possibility of improvement by selection has already appeared (cf. "Plant Breeding Abstracts", Vol. XI, Abst. 295).

## MEDICINAL PLANTS 633.88

582. 633.88–1.524(41)
**Economy in the use of drugs in war-time.**
Med. Res. Coun. Ther. Req. Comm. London 1941 : War Memor. No. 3 : Pp. 18.

The Therapeutic Requirements Committee of the Medical Research Council has published a pamphlet containing a list of drugs whose production within the British Empire should be encouraged. Among the most important drug plants of those recommended for cultivation in the United Kingdom are: *Anethum graveolens* Linn., *Atropa Belladonna* Linn., *Chondrus crispus* Stackhouse, *Digitalis purpurea* Linn., *D. Lanata* Ehrbart, *Hyoscyamus niger* Linn., *Mentha piperita* Linn., *Datura Stramonium* Linn. and *D. Tatula* Linn.

## RUBBER PLANTS 633.91

583. Mann, C. E. T. 633.912:575
**Improvement of yield in *Hevea brasiliensis*.**
Proc. 7th Int. Genet. Congr. Edinburgh 23–30 August, 1939 (1941) : p. 209. (Abst.)

Seedling families whose average yields are equal to those of budded trees of the best clones may be obtained by breeding between selected parents. Budded trees, however, are superior to seedlings in that they are very uniform. Variability within high-yielding seedling families is of considerable importance in that it gives further opportunities for the successful application of the vegetative method. It is also pointed out that characters, other than satisfactory latex-yielding properties, are of great practical importance.

## FRUIT TREES 634

584. Hoblyn, T. N. 634.00.14
**Testing new varieties of fruit plants.**
Proc. 7th Inst. Genet. Congr. Edinburgh 23–30 August, 1939 (1941) : p. 147. (Abst.)

The problems of testing new varieties of fruits are discussed. It is also pointed out that most new improvements are rather in the direction of fruit quality or resistance to disease than in actual yielding capacity.

585. FLECKINGER, J. 634.1:576.356.5:581.4
Caractères morphologiques et végétatifs en relation avec la triploïdie chez le pommier et le poirier. (**Morphological and vegetative characters in relation to triploidy in apples and pears**).
Proc. 7th Int. Genet. Congr. Edinburgh 23–30 August, 1939 (1941) : p. 121. (Abst.)
It is pointed out that in both apples and pears triploid varieties are more vigorous than the diploids. Measurements of leaf thickness and of leaf areas are given. The triploids have thicker and larger leaves than diploids in both apples and pears.

586. HALL, D. 634.11:575(42)
**Apple ' Lane's Prince Albert'.**
J.R. Hort. Soc. 1941 : **66** : 96–97.
According to the account quoted here the apple variety Lane's Prince Albert was derived from a tree planted by the breeder Thomas Squire, in Berkhamsted in 1840. This tree was either the original seedling (the origin of which is unknown) or a graft from it.

587. 634.23:576.354.4
RAPTOPOULOS, T. 634.23:576.356.5:581.162.5
**Chromosomes and fertility of cherries and their hybrids.**
J. Genet. 1941 : **42** : 91–114.
Meiosis was studied in the pollen mother cells of a range of types of cherries.
In the sweet cherry, *Prunus avium* L. ($2n = 16$), 8 bivalents were usually found, with an average chiasma frequency per bivalent of 1·34. Univalents only occurred in a few cases.
Of the six varieties of Duke cherries ($2n = 32$) studied, five formed an average of about 6 quadrivalents per cell and the other, Late Duke, 3·75. The average chiasma frequency (half-chiasmata per chromosome) was 1·59. The Duke cherries are therefore probably auto-tetraploids.
The sour cherries, *P. Cerasus* and the closely related *P. fruticosa* ($2n = 32$) formed an average of two to three quadrivalents, the average chiasma frequency being 1·32. It is suggested that these are also autotetraploids but of earlier origin than the Duke cherries, the lower chiasma frequency being a result of (natural) selection for fertility.
*P. cantabrigiensis* Stapf. (Chinese Early), with $2n = 32$ chromosomes only formed one quadrivalent in 11 out of 25 cells studied, the other 14 having 16 bivalents in each. But the chiasma frequency was 1·43 and it therefore appears that this type is an allotetraploid.
The tetraploid hybrid 10/34 (*P. cantabrigiensis* x *P. Cerasus* var. Coe's Carnation) formed an average of 1·95 quadrivalents per cell compared with 2·20 in the *Cerasus* parent and 0·44 in the other. The chiasma frequency in this hybrid was 1·34. The other tetraploid hybrid studied was May Duke x Morello, the latter being a sour cherry. This hybrid had 5·20 quadrivalents per cell and a chiasma frequency of 1·59, thus showing that the quadrivalent frequencies of the two parents were dependent on the genetically determined chiasma frequencies.
The triploid hybrids studied were *P. cantabrigiensis* x *P. avium*, *P. avium* x Duke and reciprocal, *P. Cerasus* x *P. avium*, *P. avium nana* and *P. Lannesiana*. All except the first behaved as autotriploids, with averages of 5 to 6 trivalents. *P. cantabrigiensis* x *P. avium* only formed an average of 2 trivalents per cell and had more bivalents and univalents than the others; it apparently has two similar sets of chromosomes and a third different set.
It is suggested that the Duke cherries are derived from *P. avium* by chromosome doubling, while the sour cherries are derived in the same way from an unknown species which differs from *P. avium* mainly in respect of gene changes.
The triploids are practically sterile. The breeding results show that aneuploid gametes do not function. In the tetraploids fertility is inversely correlated with quadrivalent formation. It is also affected by the manner of disjunction of the quadrivalents and it appears that once the stage is reached where there is at least one quadrivalent in every cell, further increase in the frequency of quadrivalents has relatively little effect on fertility. *P. cantabrigiensis* is as fertile as the diploids.

## NUTS 634.5

588. Babu, C. N. 634.58:576.353:576.356

**Chromatin bridges in the root tip of groundnut.**

Curr. Sci. 1941 : **10** : 173–74.

Chromatin bridges at anaphase and telophase were observed in somatic mitosis in root tip cells of groundnuts. A fragment in addition to the bridge was also observed in some cells.

## SMALL BUSH FRUITS 634.7

589. Lewis, D. 634.711:576.356.5:575"793"

**The relationship between polyploidy and fruiting habit in the cultivated raspberry.**

Proc. 7th Int. Genet. Congr. Edinburgh 23–30 August, 1939 (1941) : p. 190. (Abst.)

Cultivated varieties of raspberries can be classified into groups, the summer-fruiting forms which bear their main crop of fruit in the canes formed in the previous year and the autumn-fruiting varieties which produce their main crop on the current season's growth. The summer-fruiting types are all diploids, $2n = 14$, and the autumn-fruiting are either triploid ($2n = 21$) or tetraploid ($2n = 28$). The polyploids have larger leaves and flowers. The autumn-fruiting habit, however, is not a direct expression of polyploidy since the habit is found in some diploids and since spontaneous triploids from diploids do not have this habit although they do have larger flowers and leaves. Breeding experiments have also indicated that the autumn-fruiting character is due to a recessive gene. The occasional summer flowers of the tetraploids produce very little good pollen but their autumn flowers have an abundance of good pollen. There may thus have been a rigorous natural selection favouring tetraploids which have the autumn-fruiting habit.

## FORESTRY 634.9

590. Osborn, A. 634.975:575.127.5

**An interesting hybrid conifer: *Cupressocyparis Leylandii*.**

J. R. Hort. Soc. 1941 : **66** : 54–55.

A natural hybrid between *Cupressus macrocarpa* and *Chamaecyparis nootkatensis* has been given the above name. In the great frost of January, 1940 it proved itself much hardier than *C. macrocarpa* and can be reproduced easily by cuttings. Seedlings have also been raised from it.

## VEGETABLES 635

591. 635.34–2.484–1.521.6:575

Walker, J. C. 635.34–2.412.5:576.16

**Disease resistance in crucifers.**

Proc. 7th Int. Genet. Congr. Edinburgh 23–30 August, 1939 (1941) : 311–12. (Abst.)

Breeding of cabbages resistant to the yellows disease caused by *Fusarium conglutinans* has been successful in the U.S.A. The highest type of resistance is due to a single gene which is dominant to others which govern various lesser degrees of immunity down to complete susceptibility. By regulating the soil temperature during testing it is possible to separate out individuals carrying the gene for high-type resistance.

In the U.S.A. clubroot (*Plasmodiophora brassicae*) is an important disease of *Brassica oleracea* but only a minor one of turnips and rutabagas. Also certain varieties of these latter two crops which are susceptible in Europe are resistant in the U.S.A. This, it is suggested, indicates the existence of physiological races of the parasite.

592. Jagger, I. C. and 635.52–2.411.4–1.521.6:575.11

Whitaker, T. W. 632.411.4:576.16

**The inheritance of immunity to mildew (*Bremia lactucae*) in lettuce.**

Proc. 7th Int. Genet. Congr. Edinburgh 23–30 August, 1939 (1941) : p. 166. (Abst.)

The development of lettuce varieties resistant to downy mildew (*B. lactucae*) is complicated by the tendency of this fungus to produce (probably by direct mutation) distinct physiological races. At least five races of the fungus are now known. Immunity to one race of the fungus has been found to be due to a single dominant factor (cf. "Plant Breeding Abstracts", Vol. X, Abst. 1144). Dominant genes for immunity have been found only in the more primitive

types of lettuce which are found in Europe and it is suggested that they occur near the centre of origin of cultivated lettuces. There is no evidence of linkage between genes for immunity and any of the various morphological characters found in cultivated lettuces.

593. Bhaduri, P. N. 635.651:576.312.315
**A study of the relation of chromosomes to nucleoli in species of *Scilla, Vicia* and *Oenothera*.**
Proc. 7th Int. Genet. Congr. Edinburgh 23–30 August, 1939 (1941) : 64–65. (Abst.)

A study of colchicine-treated roots of *Vicia Faba* has shown a correspondence between the number of nucleoli and the number of chromosomes with nucleolar constrictions.

594. Schreiber, F. 635.652:575.11.061.63
**The genetics of partial coloration in beans (*Phaseolus vulgaris*).**
Proc. 7th Int. Genet. Congr. Edinburgh 23–30 August, 1939 (1941) : p. 256. (Abst.)

The inheritance of the seed-coat patterns of garden beans is discussed. A dominant factor *P* must be present for the development of any coloration and there is a recessive factor *t* for partial coloration. Two genes, *Z* and *L*, control the type of partial coloration of partial coloured beans of constitution *PPtt* and the following types can be distinguished either by their appearance or breeding behaviour:—*ZZLL* is the Marginata type, *ZZLl* the Ambigua type, *ZZll* the Expansa type, *ZzLL* the Laciniata type, *ZzLl* the Intermedia type, *Zzll* the Ambigua type, *zzLL* and *zzLl* both the Erasa type and *zzll* is the Restricta type. The two Ambigua types cannot be distinguished phenotypically—neither can the two Erasa types.

595. Lamprecht, H. 635.652:575.127.2:575.11:581.162.5
**The limit between *Phaseolus vulgaris* and *Ph. multiflorus* from the genetical point of view.**
Proc. 7th Int. Genet. Congr. Edinburgh 23–30 August, 1939 (1941) : 179–80. (Abst.)

Crosses between *P. vulgaris* and *P. multiflorus*, two well-characterized Linnean species, were studied. The crosses succeed only with *vulgaris* as female parent. Two types of plants, "giants" and "dwarfs", are found in variable proportions in the $F_1$'s. The giants are large, normal green plants with many hundreds of flowers and low fertility; the dwarfs have some yellowish greyish green leaves and small buds and are completely sterile. Quite fertile and constant families and lines were selected from the $F_5$ to $F_9$ generations. Some lines, which may be called *P. multigaris*, show combinations of taxonomic characters from both parents whilst others, called *neovulgaris* and *neomultiflorus* respectively, resemble either *vulgaris* or *multiflorus*. Both parents and all the lines investigated had a chromosome number of $n = 11$. Crosses between lines of *multigaris*, *neovulgaris* and *vulgaris* were also studied. Some $F_1$'s of these crosses consisted of 100% apparently normal plants, others of 90% normals and 10% dwarfs, others of 100% low, quite sterile dwarfs and others of 100% lethal plants which died after 4–6 weeks. The apparently normal plants were always more or less sterile. These results suggest that the difference between *P. vulgaris* and *P. multiflorus* is caused by a number of genes and not by dominance or recessiveness of genes. These differences in genes form the differences in chromosome structure in the two species.

596. Woodworth, C. M. 635.655:575.113.6
**Inhibiting factors in soy beans.**
Proc. 7th Int. Genet. Congr. Edinburgh 23–30 August, 1939 (1941) : p. 318. (Abst.)

A number of inhibiting genes have been found while studying the genetics of soya beans. A gene $P_1$ suppresses the action of the gene $P_2$ for pubescence. Both the dominant and recessive glabrous types are small plants. A multiple allelomorphic series for seed coat coloration has been discovered—the factor *I* inhibits black and brown colours in the seed coat, $i^h$ permits black or brown to produce a saddle pattern and the bottom recessive *i* produces self black or brown beans. An inhibitor, $T_2$, prevents the action of the gene $T_1$ which produces tawny pubescence (tawny pubescence is dominant to grey, $t_1$). $T_2$ has no effect on the complementary action of $T_1$ with *R* which produces black pigment in the seed coat. Indeterminate growth habit (*Dt*) is normally dominant to determinate (*dt*). There may, however, be a gene which

inhibits the effect of *Dt*. Small size of the wild soya bean is partially dominant to the large size of domestic types and it is suggested that this may be explained by assuming that the wild soya bean carries inhibiting factors for seed size.

597. SANSOME, E. R. 635.656:576.354.4:576.356
**Abnormal meiosis in *Pisum sativum*.**
Proc. 7th Int. Genet. Congr. Edinburgh 23–30 August, 1939 (1941) : p. 255. (Abst.)

Two sister plants of an $F_2$ family formed a variable number of bivalents at meiosis, the number of bivalents per nucleus ranging from 0 to 7 with a maximum number of nuclei having 4 bivalents. The chiasma frequency per actual bivalent was found to be only slightly lower than that of normal plants. Univalent formation in this case appears to be due to some reaction of a "trigger" nature inhibiting chiasma formation.

598. SINGLETON, W. R. 635.67:575.125:575
**Hybrid vigour and its utilization in sweet corn breeding.**
Amer. Nat. 1941 : **75** : 48–60; also Proc. 7th Int. Genet. Congr. Edinburgh 23–30 August, 1939 (1941) : 264–65. (Abst.)

The history of the discovery and utilization in corn breeding of hybrid vigour is outlined. The contributions of Shull, East, Jones and later of Glenn M. Smith are mentioned. It is also pointed out that the most successful sweet corn hybrids are single crosses. The second part of the paper deals with our present knowledge of hybrid vigour and it is emphasized that the utilization of hybrid vigour in producing sweet and field corn hybrids has far exceeded our knowledge regarding the working of this vigour. Tests of Jones' dominant linked genes hypothesis for accounting for hybrid vigour are outlined. Mention is made of Richey and Sprague's convergent improvement studies and of Dobzhansky and Rhoades' inversion method for locating favourable growth genes. Finally it is pointed out that in an inbreeding programme it is known to be advantageous to select for good root system, stiff stalk, good grain quality, resistance to drought, heat and cold, to insect attack and to plant diseases.

# Part II. Foreign.

## STATISTICS 519

599. DWYER, P. S. 519.241.1

**The calculation of correlation coefficients from ungrouped data with modern calculating machines.**

J. Amer. Statist. Ass. 1940 : **35** : 671–73.

The author describes in detail a well known technique of calculating a correlation coefficient with modern calculating machines. Many modern machines provide a capacity of 10 digits in their keyboard or setting mechanism, a capacity of 10 digits in their multiplier register and of 20 digits in their product register. On such machines and with pairs of records $x$, $y$ given to 3-figure accuracy, the five items required for a correlation-coefficient (viz. $Sx$, $Sy$, $Sx^2$, $Sy^2$, $2Sxy$) can be produced simultaneously in one run. Some machines are fitted with certain devices which make it possible to produce the above items fully-automatically with only one setting of $x$ and $y$.

The author mentions the Monroe calculating machine (model A1) as having "this unique feature". Actually the Madas machine was the first to be equipped in this way and has helped to produce many a correlation coefficient by the very method the author has described.

H. O. H.

## BREEDING 575

600. 575:016

AKEMINE, M. 576.3:016

**(General reference books and periodicals on genetics and plant breeding).**

J. Sapporo Soc. Agric. and For. 1941 : **32** : 37–61.

Lists of general reference books on genetics and allied subjects are given. There are 203 titles (84 English, 57 German, 35 Japanese, 18 French) in the genetics list; 77 titles (48 English, 15 German, 12 Japanese) in the biometry section; 46 titles (15 English, 17 German, 12 Japanese) under the heading cytology, and in the plant breeding section 84 titles (16 English, 34 German, 19 Japanese, 8 French). Very few books in languages other than those given above are listed, e.g. there are only 2 Swedish and 2 Russian titles in the totals for all sections. The compilation includes books published in 1940. It is estimated that about 100 books have been published during the last five years. The lists include such books as Darwin's "The origin of species" and "The variation of animals and plants under domestication" (published 1868), Focke's "Die Pflanzen-Mischlinge" (published 1881) and Weissmann's "Das Keimplasma" (published 1892) and "Aufsätze über Vererbung und verwandte biologische Fragen" (published 1892). Most of the more recent books have, of course, been reviewed in "Plant Breeding Abstracts". It is proposed to publish a list of reference books dealing with special subjects of genetics and plant breeding in another report.

601. HILDEBRAND, A. 575:633(43.8)

Die Pflanzenzüchtung im Warthegau. **(Plant breeding in the Warthe district).**

Mitt. Landw. 1940 : **55** : 469–470. (From Forschungsdienst 1940 : **10** : p. *111*).

About the turn of the century interest in varietal problems and the development of a seed industry led to the beginning of plant breeding in the province Posen. The "Posener Saatbauverein" (Posen Seed-growing Association) was founded in 1906 under German rule and continued to function under Polish rule.

The Poles, according to the author, encouraged the development of cereal types suitable for the extensive cultivation characteristic of middle and eastern Poland and therefore less suitable for the more intensive conditions in the west. The breeding work to be built up under the new German rule will need different aims.

A brief survey of the available pedigree varieties is given. The locally bred varieties will have to be supplemented by German varieties. The former are distinguished by good yield and resistance to lodging and to diseases.

602. Benediktov, I. A. 575:633(47)
**(Reorganization of the work of the scientific research institutes in connexion with agriculture).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1940 : No. 8–9 : 6–8.

Surveying the immense resources of the U.S.S.R in regard to scientific institutes, laboratories, personnel, etc., the advances that have been made in plant breeding and improvement, the exploitation of plant resources, regionalization of varieties and crops and the production of forms for cultivation in the extreme north are enumerated. Defects, however, still exist in the system of research in the U.S.S.R. which are held to lead to low yields, in some instances, to lack of co-ordination between science and economic requirements, to an unsatisfactory state as regards the distribution of the scientific institutes in the country and their organization and the qualifications of the staffs, and finally to over-specialization in scientific fields.
Problems for future solution by plant breeders include (1) the production of a high yielding winter wheat, resistant to disease, lodging and frost damage and (2) the development of new varieties of oil plants and other crops.

603. Frenkel, A. I. and
Seleznev, N. N. 575:633(47)
**(Summary of the work of the State Breeding Stations for 1938/39).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1940 : No. 7 : 3–9.

A survey is given of the development and organization of plant breeding and seed production in the U.S.S.R. Breeding work is in progress with 73 different crops and in the three years 1938–40 some 450 new and promising varieties have been released for testing. Some of these new varieties are specially promising. Thus the winter wheat Novoukrainka 83 (Ukrainka x Marquis) is very productive, rust resistant and high in baking quality; Ferrugineum 91, a selection from the hybrid Krasnodarka 622, is distinguished by high yield and standing capacity; Zernogradka, a hybrid between Zarja and a local wheat, is resistant to cold, drought, brown rust and shedding. Two selections of spring durum, Melanopus 180 and Garnovka 367, are early, drought resistant and higher than the local standards in yield. Spring wheats of improved yield, drought resistance and standing capacity have also been produced by hybridization. The spring barley 1–H–1918, produced by hybridization, is early and good in grain quality; a naked barley and various other improved forms of spring barley have been produced by selection. An early oat of good standing capacity, Northern 990, has been produced from crosses with the local white oat and many other improved forms of this and other crops are mentioned.

604. Latčenko, V. N. 575:633(47)
**(The Šatilovo Breeding Station –participant in the Soviet Agricultural Exhibition).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1940 : No. 7 : 32–35.

The attainments of the station include improved forms of winter rye, disease resistant spring wheats, oats resistant to rust, smut and lodging, promising varieties of buckwheat, millet, clover and peas.

605. Ol'khovoi, G. D. 575:633(47)
**(The work of the Gory State Breeding Station).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1940 : No. 4 : 6–7.

The station has produced improved varieties of maize and other crops. An improved thresher for single ears has been designed, and many other small improvements in technique have been made.

606. Seleznev, N. N. and
Tomaševič, Z. F. 575:633(47)
**(Exhibit at the 1940 Agricultural Exhibition of the achievements of the State Breeding Stations and of the most distinguished Soviet breeders).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1940 : No. 5 : 3–5.

Among the achievements referred to are the production of more prolific forms of a number of crops, the production of rust-resistant wheats, and many *Triticum-Agropyron* hybrids, one of which, referred to as *Agrotritica*, gives annually one crop of grain and one to two crops of hay.

607. G—R., C.–Fr. 575:633(48.5)
Den skånska växtförädlingen arbetar målmedvetet. Ett besök på Weibullsholm. (**Scanian plant breeding follows a plan. A visit to Weibullsholm**).
Lantmannen 1940 : **24** : 621–22.

On visiting Weibullsholm after the recent fire there, the author was impressed by the rapid resumption of work and the development of new strains of pasture plants (e.g. disease and pest resistant clovers) and other crops. Opium poppies are being bred for oil production and from German seed in the first instance. Selection is being directed to types that do not shed their seed at maturity. The special cultural requirements of this crop are also being studied. Trial sowings of millets are being raised and maize too which is regarded as a more important creal for Sweden. Howes Alberta maize has given the best results. The economic possibilities of the soya bean are also being investigated and crosses to increase yields are being made with the best German and other varieties, those from the United States and Canada having proved best suited to Swedish conditions.
Next season it is hoped to produce an oat resistant (though for one year only) to grey spot.
A new barley called Balder is being multiplied up. It is derived from Maja and Gullkorn [= Golden barley], gives a high yield, has stiff straw and in malting tests has equalled Kenia.
A new Slättbo Barres mangel which has 1% more dry matter than the old strains has been developed. It is smooth and well shaped. Work is proceeding on the production of club-root resistant swedes and it is hoped that one promising resistant type will also prove a good yielder.

608. G—R., C.–Fr. 575:633(48.5)
Utsädesföreningen inför nya uppgifter—Ett besök på Svalöf. (**The Seed Association confronting new tasks—A visit to Svalöf**).
Lantmannen 1940 : **24** : 674–76.

Winter-hardiness tests of wheat at Svalöf have confirmed the results already obtained in freezing experiments in the laboratory. In contrast to many imported varieties the old Swedish land wheat showed a normal stand in spite of the severe winter. A cross between Seger and Opal is very promising. Also North German and Dutch types of winter barley have been crossed with good results, winter-hardiness being excellent both in the laboratory and in the field.
Some superior strains of peas of good flavour and easily cooked have been produced at Svalöf. It is hoped to produce varieties of vetches free from the bitter constituent that renders this crop unsuitable for fodder.
Flax improvement has resulted in the production of two high grade fibre types, Herkules and Blenda, which with home and foreign varieties are being used in hybridization to obtain improved fibre varieties. The possibility of developing dual purpose types for fibre and seed combined is being considered, in view of the good performance of the variety Concurrent imported from Holland.
Special buildings and equipment have been provided for testing the textile properties of flax.
Hemp is also being grown for fibre and also a plant related to the common nettle.
Poppy, sunflower and safflower are being studied as sources of oil and the soya bean for its oil and protein content too. Maize breeding is proceeding and a suitable type for cultivation in Sweden should be obtainable.
Tobacco breeding has recently been begun, the aim being a leaf that will be suitable for use as pipe and cigarette tobacco of the Virginia type as well as for snuff. Swedish local strains will be examined first and hybridization with American varieties will follow.
Sweet lupin should become an important fodder and silage crop in Sweden once seed becomes obtainable at a reasonable price. The sweet forms are being crossed with available lines and with bitter lupins with various desirable features. Once the problem of eliminating the tendency to splitting of the pods is solved, seed will be available for growing the crop as a fodder of high protein content.
The application of genetics and cytological methods to the production of crops and trees is being carried out at the Chromosome Laboratory, special attention being given to the study of the economic value of tetraploid forms.

609. J . . . ., J. 575:633(48.5)
Utsädesföreningens årsmöte på Svalöf. (**Annual Meeting of the Seed Association at Svalöf**).
Lantmannen 1940 : **24** : 653–55.
At this conference the contribution of the Association in meeting the needs of the country in the present emergency in Sweden was emphasized and a paper was read by Prof. Å. Åkerman on recent achievements in Sweden in the breeding of cereals, legumes (including sweet lupins and soya beans), poppies and maize and in developing flax growing and improving tobacco. Advances in technique, such as chromosome doubling and the use of X-rays to induce mutations were also mentioned.

610. 575:633(48.9)
**Some prominent Danish varieties and strains of agricultural and horticultural plants, 1937.**
Roy. Agric. Soc. Denmark, Copenhagen 1939 : Pp. 7 + Suppl.
Lists are given, with very brief descriptions and references to more detailed descriptions of prominent Danish varieties of winter wheat, two-rowed barley, spring oats, mangels, fodder beet, sugar beet, swedes, turnips, carrots (fodder and table), red, white and alsike clover, yellow trefoil, perennial and Italian rye grass, meadow fescue, cocksfoot, timothy, field brome, rough-stalked meadow grass, white and red cabbage, cauliflower, brussels sprouts and spinach. In a supplement (1939) additional strains of swedes and varieties of white cabbage and carrots for table use are given.
Samples of commercial seed of these varieties were available for experimental purposes from the Royal Agricultural Society of Denmark.

611. 575:633(81)
O que é e o que tem feito a Estação Experimental Fitotécnica de Bagé. (**What the Experiment Station for Applied Botany at Bagé is and what it has done**).
Rev. Agron., Rio Grande do Sul 1941 : **5** : No. 49 : 65–67.
In its ten years of activity the station has tested 600 varieties of wheat, 90 of oats, 50 of barley, 30 of maize and 50 of leguminous and other crops. It has issued 6 improved varieties of wheat, 2 of oats and 1 of maize. Some of the most successful have been the wheats Fronteira and Surpreza, both products of the cross Polissú x A. Chaves. Fronteira is still very widely cultivated. Further promising selections have been made from the crosses Fronteira x Centenário, Fronteira x Mentana and M5 x Mentana. One of the most promising varieties is Rio Negro.

612. 575:633(85)
Memoria de la Estación Experimental Agrícola de la Sociedad Nacional Agraria, Lima, Peru. (**Report of the Agricultural Experiment Station of the National Society of Agriculture, Lima, Peru**). (1938) 1939 : No. 11a : Pp. 363.

**Pyrethrum.**
Pyrethrin contents of up to 0·96% (pyrethrin I 0·36 + pyrethrin II 0·60%) have been obtained in some of the locally grown flowers. The relatively high proportion of pyrethrin I makes the Peruvian product higher in toxicity than that of a number of other countries: some of the samples had a ratio of 1 : 1, which is equal to the Kenya product.

**Maize.**
Inbreeding and selection is being followed by single and double crosses, the objects being the production of both grain and fodder varieties.

**Barley.**
Varietal observations have been made on mildew resistance.

**Potatoes.**
Comparative tests were made of varieties obtained from the regions of Tarma, Canta and San Mateo. The variety from Tarma proved the earliest in maturity, that from San Mateo the

best in yield, with 18,250 kg. per ha. The Canta and San Mateo varieties appeared more resistant to blight, mosaic, *Rhizoctonia solani*, noctuids and other pests. The Canta variety was highest in starch content (13·5%).
Observations have been made on the potato collection from Puno.

**Cotton.**
Selection work has been continued in the years 1936–37 and 1937–38 on the Tangüis types Cñ–LM, C–LM and P–LM and on a selection of the Cñ–LM type, No. 7–35, from a plant isolated in 1934–35 on account of its good lint characters and earliness.
Tabular data are given of the following characters:—Yield per plant of the first and second crop; net weight of lint; weight of seed; weight of 100 seeds; lint percentage, index and length; uniformity; texture; tenacity; resistance (drag); lustre, colour and grade; the colour of the seed coat and fuzz.
The cleistogamous form C–LM is distinguished by higher weight per boll and lint percentage and for this reason is being crossed with other lines, such as Cñ–LM and Cñ–LM 7–35, which have excellent lint of the typical Tangüis quality and are early in maturity.
The characteristics of the lines selected in 1938 are given in tables. The results show that the selection work has effected a very real improvement in the quality of the lines concerned.
Line Cñ–LM 7–35, in addition to superior lint quality and earliness, is distinguished by great uniformity but 2500 plants have been examined for lint qualities and the best 120 selected. The results clearly show the great uniformity of the line, the curves being quite regular and the coefficients of variation low.
A total of 45,300 seeds have been analysed, "the product of the study of 300 seeds arising from 151 plants marked in the field". The proportions of the different classes naked, fuzzed, semi-fuzzed and variegated are given.
The proportion of fuzzed seeds has fallen considerably, showing that there has been an elimination of this type in the course of selection.
Photographs 1–3 illustrate the lint of Cñ–LM 7–35, 4–9 that of Cñ–LM–1938, 10 and 11 that of P–LM–1938 and 12 and 13 C–LM–1938, in all of which the great uniformity is noticeable.
*Verticillium* wilt. Selection of Tangüis lines capable of growing on wilt infected soil has continued. Some 78 phenotypically immune plants have been studied, together with 39 lines phenotypically resistant. These lines have all remained healthy when grown on infected soil. No other variety of *G. peruvianum* compared with Tangüis in resistance, even Pima, which in the U.S.A. is considered resistant to *Verticillium*. The Upland varieties were less resistant still.
A study has been made of 53 crosses involving the three Tangüis types, a pubescent selection CB.17 and Giza 7. The $F_1$s have been back-crossed with the parents. Interspecific crosses between various Tangüis types and Upland cottons (Acala) have also been made and the $F_1$ plants are under observation.
$F_4$ generations of crosses of Tangüis Cñ with Sakel, Egyptian, Delfos and Acala are also under observation.
X-ray treatment has been carried out on seedlings of Cñ–LM 86, P–LM 224 and C–LM 17. No effect has been observed in the resultant plants but a second generation is to be produced and studied.
A cotton collection consisting of 399 specimens has been established.

**Sugar cane.**
The varieties B.H.10 (12) and Cristalina are the only ones that have maintained their superiority to Bourbon in the fourth cutting season, B.H.10 (12) having shown marked superiority in cane per acre and also in sugar yield per acre.
The same applies to the variety D.95 in the second experiment, P.O.J.2714 and 36M. in the third, D.1135 and Morada in the fourth; in the fifth experiment P.O.J.2878 has proved best in yield and sugar per acre in the third cut.
A sport of P.O.J. 36 M. was found in 1934, differing from the original variety in being uniformly pigmented without stripes and having considerably thicker canes (weight 2·610 kg. as compared with 1·730, diameter 36 mm. as compared with 28); it has been named P.O.J. 36 L.M. (La Molina). It has been compared with the original variety and with Co.281. In average height it was somewhat below P.O.J. 36 M. in the early stages but was higher in the later stages. In germination there was no difference.

613. 575:633(92)

Commissie van advies inzake de bevordering van de cultuur van handelsgewassen. (**Advisory Committee on the promotion of the cultivation of industrial plants**).
Bergcultures 1940 : **14** : 1427–42.

This article is an extract from the 1939 report of the above Committee (cf. "Plant Breeding Abstracts", Vol. XI, Abst. 345) and deals with its functions and work in developing and improving various crops in the Netherlands East Indies and in promoting and co-ordinating research at experiment stations and other centres.
Among the various plants and economic products reported on are: *Derris*, *Pyrethrum*, *Aleurites montana* Wils (cf. "Plant Breeding Abstracts", Vol. IX, Abst. 1157), *Perilla* oil, Manilla hemp, ramie, *Eugenia aromatica* O.K., *Amorphophallus* sp., peppermint species, paper and cellulose from different timbers, and numerous medicinal plants including *Digitalis*, *Cucurbita moschata*, *Orthosiphon grandiflorus* Bold., Chaulmogra and *Carica papaya* Linn.
Derris selection is being continued and about 20 clones are being tested under different conditions in various regions. Specimens of Derris are still being collected in the outlying regions. Seed was obtained from some of the oldest hybrids whilst already a few crosses have been made with the oldest wild material collected.
Large areas under Derris only are being grown to find out whether they are a paying proposition.
A further substance, derride, with insecticidal properties half as powerful as rotenone has been identified in derris root.
Pyrethrum breeding is proceeding apace under the direction of the Agricultural Institute to discover forms that will be productive even at low elevations above sea level and to increase production in general.
The problems pertaining to the development of Tung oil (*Aleurites montana*) production in the Netherlands East Indies have already been reviewed (cf. "Plant Breeding Abstracts", Vol. IX, Abst. 1157). Climatic adaptation and soil requirements of *Aleurites* in East Java are also subjects of research at the present time. Results of work on *Aleurites* up to 1939 were to have been published in 1940.
The possibilities of developing *Perilla ocymoides* L. as an oil crop and *Boehmeria nivea* for fibre are also being studied with apparently somewhat promising results. Selection and research on cultural problems have been begun by the General Experiment Station for Agriculture [ = Algemeen Proefstation voor den Laudbouw]. Large scale cultivation of ramie is now being encouraged.
The study of cloves (*Eugenia aromatica* O.K.) suggests that the differences in the commercial value of the product are probably due to hereditary as well as environmental factors. The tree is apparently almost entirely self-pollinating so that valuable types once discovered could be easily reproduced. A study of wild forms is being made with a view to their use in breeding.
In the search for species of *Amorphophallus* with a high mannan content several specimens possibly of considerable value for further selection and breeding were found. Much chemical research has been done on the product obtained from this crop.
Four promising forms of peppermint have been identified among the numerous specimens imported from Europe.
A list is being drawn up of all the medicinal plants of which there are authentic specimens available for investigation if necessary.

614. 575:633(92)
633.0015(92)

Overheidszorg voor den landbouw en de binnenvisscherij in 1939. (**Government provision for agriculture and inland fisheries in 1939**).
Landbouw 1940 : **16** : 557–603.

The great demand for high grade seed in different parts of the Netherlands East Indies is being met in many regions by extensive development of the system of seed farms.
Intensive rice selection is being continued and varieties found to be suitable are gaining ground in various regions in Java and Celebes.
The groundnut variety Schwarz 21, which is so resistant to slime disease, is being multiplied and distributed. Similar intensive work is being continued in distributing good, non-poisonous varieties of cassava such as *aipin mangi* and *aipin Valenca* in Java, Sumatra and Celebes.

Native rubber cultivation is being improved by propaganda and by the distribution of improved seed and buddings from high yielding clones.
In many copra districts in Java seed selection from superior mother trees is being continued.
Coffee plantations are to be laid down for selection work and experiments on cultivation.
Shade trees (dadap, *Albizzia moluccana* and lamtoro) are being studied as well as various new crops, e.g. *Aleurites montana, Derris elliptica, Pyrethrum* and *Amorphophallus* sp., cinnamon, cloves and nutmeg. Strain selection of *Pyrethrum* was begun in 1939.
Selection of cigarette tobacco at Talven (Bodjonegoro) is being extended and problems of cotton and tea cultivation are also receiving attention. Photoperiodism and the vernalization of Virginia tobacco are being investigated with the object of increasing the number of leaves of this crop.
Native fruit and vegetable growing is also being improved.
In many of the pepper growing regions the variety lada belantoeng, which is resistant to dying off, is being multiplied.
The work of the General Agricultural Experiment Station [= Algemeen Proefstation voor den Landbouw] has been directed to the production of disease resistant stocks. Also a study tour was made of the kapok districts of French Indo-China and Siam.
Specimens of wild derris have been collected and the occurrence of *Amorphophallus* species containing mannan investigated.
Hybridization between the common potato and the disease resistant South American species was continued and large numbers of crosses were made in Holland during the summer.
The investigations on flowering in *Aleurites* were provisionally concluded and were of value in deciding the trend of selection. Incidentally some promising trees were noted and plant material obtained from them in the Bodja central *Aleurites* garden. Also valuable importations from Tonkin had developed very well in 1939.
To ascertain whether it would be possible to grow cloves in the country which would be suitable for industrial use, a general study of cloves has been begun and a tour of Benkoelen and Ambon has been made. Leaf shedding and the possibility of obtaining oil from the leaves shed are being examined. Provisional conclusions on pollination and fruit setting have been reached. The causes of periodicity in bearing and the incidence and polymorphism of the wild and cultivated clove are being studied.
The causes of mentek disease and the relation between susceptibility and the root development in different varieties of rice are being investigated.
The possibility of the existence of varieties of soya bean resistant to *Plagiodera* is being examined.
Comparative tests were made of various Javenese samples of *Pyrethrum* to determine their insecticidal value.
Large numbers of potato varieties were tested for susceptibility to *Phytophthora* and slime disease and several varieties and hybrids have been selected for resistance to both diseases and are to be used for more large scale crosses with the South American seedlings already collected. Plantations of this material have been laid out at Soemberbrantas and Ngadisari (East Java).
Maize trials for resistance to *Sclerospora maydis* are being continued with different races. Many varieties, including some imported ones, appear to be highly resistant. A study of the *Phytophthora* species and races found on *Citrus*, roselle, rubber, *Cinchona* and other crops has been begun.
The work of the Agricultural Institute [= Landbouwkundig Institut] has included discussions on perennial crop trials; the completion of the breeding plots for maize and soya bean at Modjosari and for drought resistant crops at Moeneng; and finally the extension of the kapok experiment plots and seed garden at Moektihardjo and of the plantation at Buitenzorg.
Cotton growing has been introduced in Besoeki.
Approved seed from certain varieties of various crops which the Institute has improved by breeding has been made available for multiplication and a descriptive list of the selected varieties has been issued.
The oentoeng variety of rice continues to hold its own by its high yield and mentek resistance and is in great demand, being specially suited to certain districts such as Bodjonegoro.
Some research on natural cross-pollination in rice was concluded (cf. "Plant Breeding Abstracts", Vol. X, Abst. 453) and some results bearing on seasonal flowering have already proved of practical value.

A white early variety of soya bean, called Lawoe, with large seed has been obtained by selection. Some large seeded black varieties have also proved of value.
More intensive research on cassava breeding was rendered possible by co-operation with some estates growing the crop and with financial aid from the Cassava Central Authority. The aim is to obtain varieties with high protein content in the root and selection is being carried on with species hybrids between ordinary Cassava and other *Manihot* species.
Roselle selection has been started on a small scale in co-operation with certain estates.
The establishment of the new Modjosari and Moeneng plantations has made it possible to begin the selection of maize, sorghum and cotton. The warm water method of emasculation of sorghum has been studied, as well as the technique of hybridization of cotton, of which some artificial crosses have been made.
Financial assistance received made is possible to press on with the selection of Virginia and Rembang tobacco in Badjonegoro in 1939.
Further progress was made with kapok breeding at Pati and some variety trials were started in East Java where coconut varieties were also undergoing trials; in Central Java coconut yield determinations were begun as a basis for the selection of valuable mother trees.
Large numbers of *Derris* clones are being tested for yield and rotenone content; cultivation is also being studied.
In co-operation with some of the larger estates a number of new *Aleurites* clones are under observation.
Breeding of *Amorphophallus* for high mannan content is in progress in conjunction with the study of problems of cultivation.
Out of 450 clones of Sereh (Lemon grass) from various localities in Java, 135 are being tested for yield of leaf and content of essential oils.
The Coconut Experiment Station at Manado is investigating problems of cultivation and yield as well as the results of crossing the common coconut with the dwarf form.
As part of a re-organization programme preliminary research on the breeding of other crops, such as cloves, Forastero cacao, nutmeg and Manilla hemp is receiving attention.
Co-operation between the test plantations and the other branches of the experiment stations has led to uniformity in methods of experimentation.
Experiments with mangos aroemanis, one of the best mango forms in East Java, show that it is adapted to less dry districts and is early maturing.
Many new importations have been made to improve the existing plant collection and land has been acquired for testing subtropical crops in dry conditions 1000 m. above sea level.
Official regulations controlling production and experimentation as regards tea, coffee, rubber (including *Hevea Spruceana* and crosses of *H. Brasiliensis* with other *Hevea* species) are mentioned with information on the financing of research and propaganda.

615. Petrov, I. P. 575:633:578.08
**(Device for sowing breeding material).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1940 : No. 4 : p. 42.
A sowing board consisting of ply-wood of 13-15 mm. thickness with 2 cm. holes drilled in it say 5 cm. apart is used for plant breeding work.

616. Weger, N. 575:633:578.08
Die Temperaturverhältnisse in Isolierkästen. **(The temperature conditions in isolation cages).**
Gartenbauwirtsch. 1940 : **14** : 604–613. [From Forschungsdienst 1940 : **10** : p. *118.*]
It was observed that plants in muslin cages suffered more easily from night frost than those in the open. Investigations with recording thermometers showed that the air temperature inside isolation cages varied more rapidly and more widely than that outside, especially in the smaller cages. The following recommendations are made: the dimensions of cages should be larger than is usual, the height should be relatively small and the material should be as wide-meshed as possible and made of smooth fibres.

617. Hove, W. Ten 575:633–1.521.5(92)
De vermeerdering en de verspreiding van hoogwaardig zaaizaad door de zaadhoeven. (**The multiplication and distribution by the seed farms of high grade seed for planting**).
Landbouw 1940 : **16** : 604–14.
A detailed discussion on the best methods for the production and distribution of superior seed material of rice, groundnut and soya bean in East Java (cf. "Plant Breeding Abstracts", Vol. X, Absts 450, 453 and 916).

## GENETICS 575.1

618. Mangelsdorf, P. C. 575.1(47)
**Genetics in Russia.**
Chronica Botanica 1941 : **6** : 256–57.
After very briefly summarizing the discussion reviewed in "Plant Breeding Abstracts", Vol. XI, Abst. 321, the author goes on to remark that it is not necessary to assume that orthodox genetics in Russia is in conflict with Marxism, for a somewhat similar situation existed in the U.S.A. with Burbank taking the place of Michurin and Lysenko, while the really important tasks, the conquest of stem rust of wheat and the development of hybrid maize, were accomplished by the methods of orthodox genetics.

619. Mitin, M. 575.1(47)
(**On advances in Soviet genetical science**).
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1940 : No. 2 : 6–18.
A detailed report of the Conference on Genetics and Breeding held at Moscow in October, 1939, and already reviewed in "Plant Breeding Abstracts", Vol. XI, Abst. 321.

620. Kostrjukova, K. Ju. and Černojarov, M. V. 575.1:575.3:576.312
(**In favour of Michurin's cytobiology**).
Jarovizacija 1940 : No. 3 (30) : 140–51.
The science of cytogenetics is incompatible with Michurin's conception of the unity existing between the developing organism and its environment, according to which the chromosome number of a perennial, like its other characters, can change with age and also with alterations of external conditions.
The results of the work based on genetics and cytology are compared unfavourably with those based on the principles of Lysenko and Michurin. Chromosome alterations themselves are considered to be only one of the many morphological and physiological changes resulting from the action of X-rays and other agencies, not the cause of these changes.

621. Oehlkers, F. 575.116.1
**Meiosis and crossing-over.**
Biol. Zbl. 1940 : **60** : 337–48.
A brief review of the more important experimental work done up to 1940 on the closer analysis of the mechanism of crossing-over and related problems. R. M. I.

622. Lysenko, T. D. 575.3
(**The ways of controlling plant organisms**).
Jarovizacija 1940 : No. 3 (30) : 27–44.
Reference is made to grafts of yellow tomatoes (variety Albino) on red (variety Mexican 353) which resulted in the formation of a certain number of red fruits on Albino. Seeds from these red fruits were sown and the resulting plants bore some red fruits, some pink, some whitish yellow and some bright yellow, different from the parental yellow. The progeny of the pink fruits bore fruits with various degrees of pink striping. Other examples of the scion having been affected by the stock are cited.
In crosses of the winter wheat *Hostianum* 0237 with the spring variety 1160 or 1163 a great many plants have arisen which shed their older leaves with the development of each successive new one, so that they ultimately die. When the spring parent was sown in autumn before making the cross this phenomenon was not observed. Addition of a certain amount of maternal pollen when making the cross was also sufficient to prevent the appearance of the lethal forms.

Plants of the wheat variety Krymka obtained from intravarietal crosses have surpassed the uncrossed material in winter-hardiness and yield.
In a variety test where 20 varieties of winter wheat were sown in juxtaposition, some plants of each were emasculated and left to open-pollination. The progeny however was almost entirely identical with the maternal line, except that it was more vigorous and hardier. This is ascribed to selective fertilization, the emasculated plants having selected pollen grains of the same variety but from different plants, thus effecting intravarietal hybridization. Other analogous cases are described in rye. The use of this selective capacity to induce the variety to improve itself is thought to be a sounder method than artificial hybridization.
*Prunus Besseyi* was pollinated in 5 successive generations with peach pollen but the progeny were constantly of the maternal type.
The improved yields obtained from potatoes grown from summer sowings as opposed to spring sowings are illustrated by figures showing a progressive rise with each generation of summer planting. This is taken as a proof of the power of environment to alter the hereditary constitution; the conversion of winter wheat into spring forms and vice versa (cf. Abst. 672) is adduced as further evidence. This method is going to be used for creating more frost-resistant varieties of cereals.

## ORIGIN OF SPECIES, ETC. 576.1

623. 576.16:575.22:581.9

Toxopeus, H. J. 575:633(92)

Herkomst, vormenrijkdom en veredeling van enkele onzer cultuurgewassen. (**Origin, wealth of forms and improvement of some of our crop plants**).

Natuurwet. Tijdschr. Ned.-Ind. 1941 : **101** : 19–30.

In attempting to breed plants for new environment (e.g. potatoes for more northerly zones where frost injury may occur or cotton for South Africa) a detailed knowledge of the plant and its various forms and geographical range is essential. The potential variability obtainable by hybridization should also be studied. An examination of the centres of origin and the multiplicity of forms of cereals, fibre plants, rubber, cacao, coffee, kapok, etc., shows that the most important crops now cultivated in the Netherlands East Indies were not indigenous there as wild forms.
Genetic constitution, the role of environment in selection and the way in which the distribution of a plant is effected are also important factors in determining its geographical range, both past and future. The applications of such considerations (and their varying importance in particular instances) are demonstrated by detailed accounts of the plant material of *Ceiba pentandra*, *Eugenia aromatica* and *Derris elliptica* which is being used in botanical studies and selection and genetical work in the Netherlands East Indies.

## CYTOLOGY 576.3

624. Ellenhorn, J. E. 576.312.381:576.353

(**A critical revision of mitosis in connexion with the theory of the spiral chromosome structure**).

J. Bot. U.R.S.S. 1940 : **25** : 189–238.

A detailed discussion of recent research on chromosome structure with special reference to the mechanics of chromosome behaviour in mitosis. A bibliography of 95 references is appended.

625. 576.356:581.032.3

Kagawa, F. 633.11:575.127.5:633.14

(**The effect of abnormal environment on the pollen formation in certain species and genus hybrids**).

Proc. Crop Sci. Soc. Japan 1940 : **12** : 5–15.

The effects of excessively dry soil on pollen formation in the $F_1$ of *Triticum compactum* x *Secale cereale* were studied in pollen mother cells of plants grown in pots and left without water until the stage when withering would have set in. The various frequencies of types of anomalies of division, such as non-reduction and the formation of restitution nuclei in different ways, which lead to the formation of diploid pollen grains and of dyads were recorded. The same plants that had been subjected to the effects of dehydration of the soil were watered so that they might return to normal for ultimate use as controls, it being assumed that the reduction

divisions in such "normal" plants would be unaffected by the previous dehydration process. The evidence showed that there was no particular difference between the above-mentioned frequencies in the individual plant when treated and untreated, though appreciable differences were found between different individuals in the treated group and also between individuals in the untreated group.
An exactly parallel relationship was found for frequencies of dyad formation.
Though dehydration of the soil had no such effect as has already been recorded by the author for the effects of temperature on *T. compactum* x *S. cereale* (cf. "Plant Breeding Abstracts", Vol. VII, Abst. 589 and Vol. X, Abst. 105), he believes that under genetically or cyto-physiologically favourable conditions, chromosome doubling may be produced by dryness acting upon the plants or anthers and that for the production of diploid pollen some fundamental factor operates in conjunction with dryness.
High temperature treatment of crosses between *Quamoclit angulata* ($2n = 28$) x *Q. pennata* ($2n = 30$) is also recorded as increasing the number of dyads produced and the results obtained indicate the importance of temperature in the production of amphidiploids.

626. FAGERLIND, F. 576.356.5
Verschiedene Arten von Polyploidie. (**Different kinds of polyploidy**).
Chronica Botanica 1941 : **6** : 25–52.

Levan has proposed the term "autogenomatic" for species whose chromosomes are structurally so similar that they are capable of complete allosyndesis in the $F_1$ hybrid. The author suggests that different degrees of autogenomy should be recognized, reserving the term allogenomatic for species in which the hybrid shows no allosyndesis. Similarly, polyploids would be regarded as having different degrees of autopolyploidy, the term allopolyploid being reserved for a polyploid of the type produced by doubling the chromosomes of the hybrid between two allogenomatic species.
It is also proposed that polyploids produced by doubling a species should be called intraspecific and those derived from species hybrids interspecific.

627. WETTSTEIN, F. von 576.356.5:576.16
Experimentelle Untersuchungen zum Artbildungsproblem. II. Zur Frage der Polyploidie als Artbildungsfactor. (**Experimental investigations on the problem of species formation. II. On the question of polyploidy as a factor in species formation**).
Ber. dtsch. bot. Ges. 1940 : **58** : 374–88.

In this paper an analysis is made of some of the phenomena which result from polyploidy and the possibilities are examined regarding selection of polyploid characters and their contribution to the adaptability and distribution of polyploid forms.
The problems of the increase in size in many polyploids and the relation between nucleus and plasma in polyploid cells are illustrated from the author's experiments with mosses.
The value of idiotypic variability and of the perhaps more important factor, the utilization of the heterosis of the hybrids, as a basis for selection, is briefly discussed. R. M. I.

628. DERMEN, H. 576.356.5:581.04
**Colchicine polyploidy and technique.**
Bot. Rev. 1940 : **6** : 599–635.

The first section of this review gives a short account of the history of colchicine-induced polyploidy in plants. The reactions of both animal and plant cells to colchicine are next discussed. There is then a section on the technique of colchicine application and finally the nature of some of the changes following induced polyploidy is considered.

629. BLAKESLEE, A. F. 576.356.5:581.04
**Effect of induced polyploidy in plants.**
Amer. Nat. 1941 : **75** : 117–35.

A paper read at the meeting of the American Association for the advancement of Science, Philadelphia, January 1941. It is pointed out that chromosome doubling results in larger flowers, pollen grains and seeds and also changes the shape of plant organs, particularly fruits. The production of fertile allotetraploids from sterile $F_1$ hybrids is also noted. Colchicine treatment may also produce periclinal chimaeras. Finally the effect of chromosome doubling on the sex of dioecious species is discussed.

630. Schwarz, P. A. 576.356.5:581.04:633.1
**Anatomical and cytological changes in seedlings from chemically treated cereal grain.**
C. R. (Doklady) Acad. Sci. U.R.S.S. 1940 : **28** : 354–56.

Treatment of seeds of wheat with aqueous solutions of granasan (ethyl-mercuric-chloride) produced morphological and cytological changes similar to those produced by colchicine and acenaphthene. "Niuifa", another mercuric seed disinfectant produced similar results, but cetyl-mercur-chloride ($C_{16}H_{33}HgCl$) was practically ineffective, even in saturated solution. On maize, granasan and Niuifa had similar cytological effects. A haploid cell was found in the root tip of a treated plant.

631. Straub, J. 576.356.5:581.04:635.656
Die Auslösung von polyploidem *Pisum sativum.* (**The production of polyploid *P. sativum*).**
Ber. dtsch. bot. Ges. 1940 : **58** : 430–36.

The shoots of young pea plants, 10–15 cm. high, of the variety Braunschweiger Folger, were for two successive mornings covered with wads of cotton wool soaked in a 0·025% solution of colchicine. The side shoots which afterwards developed were removed. Of the 5 surviving plants, three weeks later, two were pure tetraploid, two were periclinal chimaeras with a tetraploid epidermis and one plant possessed a tetraploid epidermis and in part also tetraploid tissue in the layers beneath. The flowers in the basal inflorescences of the tetraploid had a mixture of haploid and diploid pollen, while the upper flowers produced only diploid pollen. The tetraploid parts of the plants were larger than the diploid. The pollen grains in the tetraploid, while not larger, were of a different shape, broader and less regular. The stomata were also larger in the tetraploid. R. M. I.

## MICROSCOPIC TECHNIQUE 578.6

632. Swanson, C. P. 578.6:581.04
**The use of acenaphthene in pollen tube technic.**
Stain Tech. 1940 : **15** : 49–52.

Pollen grains are germinated on an artificial medium and the developing pollen tubes are exposed to the vapour of acenaphthene crystals. The acenaphthene disturbs the spindle mechanism so that the chromosomes of the dividing nucleus are not crowded on a metaphase plate but are widely separated in the tube.

633. Thomas, P. T. 578.6:634
**The aceto-carmine method for fruit material.**
Stain Tech. 1940 : **15** : 167–72.

An account is given of radical modifications in the fixation and mordanting methods used with aceto-carmine which make the method capable of giving very satisfactory results with small chromosomes such as occur in fruit plants.

## BOTANY 58

634. Adler, R. 581.143.26.035.1:575:633
Das Wesen der Kurz- und Langtagpflanzen. (**The nature of short day and long day plants**).
Forschungsdienst 1940 : **9** : 332–67.

In this survey of research the roles of light (including moonlight), temperature and other environmental factors and their interaction in eliciting the phenomena of photoperiodism are reviewed with special reference to development in plants of economic importance. A list of short day, long day and neutral plants is given with references to relevant literature mainly from German sources.

The applications of the results obtained in this field of research are indicated for plant breeding, variety testing, the establishment of new aims in breeding and for practical horticulture. A special section deals with findings on the inheritance of the photoperiodic reaction.

635. 581.162.5:577.17
575.183
Yasuda, S. 581.331.2:575.42
(**Some physiological problems on the reproduction of higher plants**).
Bot. and Zool. 1937 : **5** : 337–42.

The lack of agreement in the results of research on self-incompatibility is possibly due to

diversity of experimental material and time and place of experiment. The writer records his own findings on the substances capable of inhibiting pollen germination on the growth of the pollen tubes. Its physico-chemical properties are still being studied.
Discussing the various types of selective fertilization studied by workers in various countries, the author suggests that research on compatibility should no longer be neglected, as it has hitherto been, in favour of work on incompatibility.
From his experiments with a few plants of the *Cucurbitaceae* and *Solanaceae* he concludes that the stimulus inducing artificial parthenocarpy is definitely chemical and that its strength is the decisive factor in producing parthenocarpy or phenospermy.
The writer also obtained some experimental evidence in favour of the pollen hormone theory but the problem still remains whether the hormone promotes either growth or division according to the nature of cells (pith or cambium) acted upon, or whether there are two types of hormone in pollen.
Surveying the experiments of various workers and himself upon xenia and meta-xenia, the author concludes by posing the question whether in meta-xenia some special substance is produced in the seed, and if so, is this substance a hormone?
The study of the problems of pollen storage and transport should no longer remain shelved, in spite of the possibilities that have been opened up by work on photoperiodism.
The possibility of selection by mechanical or physiological means as early as the pollen stage is considered in the light of the experimental findings so far obtained.

636. Poddoubnaja-Arnoldi, V. 581.163
**(Present position as regards the problem of asexual reproduction in angiosperms).**
J. Bot. U.R.S.S. 1940 : **25** : 75–91.

A review of the work that has been done on apomixis in various plants (including some of economic importance). The literature cited in the bibliography has provided material for discussion under the following heads: Terminology and types of apomixis; apomixis in relation to chromosome number and polymorphism; apomixis and the origin of new plant forms; the causes of apomixis and its theoretical and practical significance.

637. Webber, J. M. 581.481:576.356.5
**Polyembryony.**
Bot. Rev. 1940 : **6** : 575–98.

The following types of polyembryony in plants are distinguished—sporophytic (adventitious embryos produced by budding from the nucellus or integument), cleavage (separation of the zygote or young embryo into two or more units), simple (formation of several eggs from a single megaspore) and euploid (multiple embryos which give rise to haploids as well as polyploids). Twin plants (cf. "Plant Breeding Abstracts", Vol. VIII, Abst. 1468) come in this last category. True and false polyembryony are also discussed, fused ovule development being an example of the latter. Many of the examples of polyembryony occur in crop plants, e.g. in *Citrus, Linum, Trifolium, Nicotiana, Allium, Gossypium,* many grasses, *Triticum* and other cereals and in *Brassica.* Mention is made of some unpublished work with twins in *Gossypium.* In this genus twins are mainly haploid-diploid in the 26-chromosome species and diploid-diploid in the 13-chromosome species. The frequency of polyembryony, its causes and its relation to phylogeny are also discussed. Finally there is a discussion on the importance of polyembryony to agriculture. There are 116 references in the bibliography.

## SEED PRODUCTION 631.531.12

638. Luk'janenko, P. P. 631.531.12:578.08:575:633
**(Selection according to specific gravity as a means of increasing the yielding capacity of seed).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1940 : No. 3 : 17–20.

Experiments are cited showing the increases obtained in yields of wheat, oats and beans by selecting the seed on the basis of its specific gravity. The actual technique recommended and the composition of the various solutions suitable for determining the specific gravity of the seed of different crops are discussed. In conclusion, the valuable results of repeated use of the size and specific gravity of seed as a criterion in selection work to obtain super-élite, élite, and other improved grades of seed are emphasized.

The method must of course only supplement, and not replace, the usual other measures in breeding and selecting seed for high quality and yield.

## PLANT DISEASES 632*

639. Stakman, E. C. 632.3:575.1:575.24
**The need for research on the genetics of pathogenic organisms.**
Publ. Amer. Ass. Advanc. Sci. 1940 : No. 12 : 9–17.

In this introductory article, the author stresses the need for research on the genetics of micro-organisms. The first step is to determine the purity, not of the species but of the biotypes which make up the species. In this connexion the range of phenotypic variability and genetic variation is of importance.

Further questions involved are whether the cytoplasm or germ plasm of the organism can be sufficiently changed by the environment to be more or less permanently affected and how far mutation is likely to affect genetical purity and the possibilities of hybridization. R. M. I.

640. Reed, G. B. 632.3:575.22
**Problems in the variation of pathogenic bacteria.**
Publ. Amer. Ass. Advanc. Sci. 1940 : No. 12 : 28–33.

A review of the subject indicates that variations have been noted in the antigenicity of bacteria and also in virulence and infectivity. Variations have also been recorded for colour, colony structure and capsulation. R. M. I.

641. Kirjalova, E. N. and
Chistovitch, T. A. 632.422.3:575.42
(**Breeding pure yeast cultures for fruit and berry wine making**).
Proc. Lenin. Acad. Sci. U.S.S.R. 1940 : No. 18 : 30–32.

An account is given of the selection of 12 strains of yeast from fermented apples and various small fruits, for use in the making of beverages from such fruits.

642. Holton, C. S. 632.451.3:575.12:633.11
**Preliminary investigations on dwarf bunt of wheat.**
Phytopathology 1941 : **31** : 74–82.

The dwarf bunt of wheat (*Tilletia tritici*) was crossed with race 12 of *T. tritici* and race 9 of *T. levis* by inoculating with combinations of monosporidial lines. Segregation was observed for chlamydospore characteristics and capacity to induce dwarfing of the host.

## ECONOMIC PLANTS 633

643. 633:582:578.08(48.5)

(1) Åberg, E. 631.521.5(48.5)
Ökade krav på sortkännedom och sortbeskrivning. (**Increased need for a knowledge of varieties and for varietal descriptions**).
Lantmannen 1940 : **24** : 503–04.

(2) Hellbo, E.
Allmänheten och sortkännedomen. (**The public and knowledge of varieties**).
Ibid 1940 : **24** : 562–63.

(3) Åberg, E.
Sortkännedom och sortbeskrivning. (**Knowledge of varieties and varietal description**).
Ibid 1940 : **24** : p. 581.

In the first of these three papers attention is directed to the need for extending the systematic study of the varieties of various crops in Sweden and for formulating exact descriptions of the different types with information on the regions for which each happens to be suited. Such information would be of special value not only to those engaged in variety trials, but also to growers to enable them to judge the purity of any seed they may raise or obtain for growing. The establishment of "seed raising centres" on suitable farms in different regions is also

* See also Abst. 612 (Pyrethrum); Abst. 613 (Derris and pyrethrum); Abst. 614 (Insecticides).

suggested. These farms would be inspected annually and could supply seed of suitable varieties and of guaranteed purity at moderate prices to the other farmers of the district.
In the second paper (a reply to Åberg's paper) the work of the Central Seed Control Institute is mentioned as including a systematic study of varieties and their characteristics with a view to control measures, as well as the publication of observations by the Control Plot Division of the Institute on hitherto unknown varietal characters. In the writer's opinion, the collection of such information calls for expert knowledge and though fully recognizing the value of a descriptive survey of the most important varieties and strains in Sweden, he does not regard the grower as a sufficiently competent observer to contribute the necessary information on the botanical characteristics from an isolated study of his own particular crop.
The potato, however, may be regarded as an exception in view of its distinctive varietal characteristics and the ease with which impurity can be detected in the clones; and a book entitled "Våra potatissorter" [= Our potato varieties], has been issued for the Swedish grower.
A system of variety certification which could be used as a subsidiary method to the existing State guarantee is described.
The third paper is a short reply to Hellbo's paper in which the writer recognizes points of agreement but further develops his own suggestions for a survey of the best varieties in Sweden, their regional distribution and economic value.

644. Åkerberg, E. 633–2.7–1.521.6(48.5)
Om angrepp av knäppare. (**On attack by wireworm**).
Lantmannen 1940 : **24** : 603–04.

An account of the damage done by *Agriotes lineatus* and of possible varietal differences in susceptibility observed in potatoes, rye and barley in Sweden.
In potatoes hardness of the tuber is thought to be a factor in resistance; in winter rye, rapidity of development appears to protect the plants. No suggestion is offered to explain the resistance of Svanhals barley.
Observations that may help to throw light on the problem of resistant types will be welcomed.

645. 633–2.8–1.521.6:575
Bawden, F. C. 633.491–2.8–1.521.6:575
**Problems in breeding for disease resistance.**
Chronica Botanica 1941 : **6** : p. 247. (Abst.).

Commenting on the article reviewed in "Plant Breeding Abstracts", Vol. XI, Abst. 408, the author emphasizes the value of varieties intolerant of virus infection. Whether the whole plant dies or merely the tissues around the point of infection, the spread of the virus through the crop is inhibited. Such a variety is effectively field immune and has the advantage over a tolerant variety that it does not act as a reservoir of infection.

646. Gutiev, G. T. 633.0015(47)
(**Reorganize the chain of subtropical scientific institutes**).
Soviet Subtropics 1940 : No. 11–12 (75–76) : 12–14.

Avdonin, N.
(**Apropos of G. T. Gutiev's article: "Reorganize the chain of subtropical scientific institutes"**).
Ibid 1940 : No. 11–12 (75–76) : 14–15.

The first paper contains some comments on changes needed in the distribution and organization of the work and staffs allotted to the research institutes in the subtropical regions of the U.S.S.R. *Inter alia* it is suggested that work on tea breeding should be allotted to districts more prone to drought and frost so that varieties resistant to these conditions could be bred.
The second paper is a reply to Gutiev's article.

## CEREALS 633.1

647. Kuznetsov, A. V. 633.1:575(47)
(**Local varieties of winter crops in the eastern regions of Kazakhstan S.S.R.**).
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1940 : No. 8–9 : 19–20.

The value of various local forms of winter cereals as material for seed production or the

breeding of improved varieties for eastern Siberia is pointed out with descriptions of local winter ryes suitable for developing for that region. A local wild rye Kokpektinskaja is regarded as one particularly promising type of material for the eastern regions of the U.S.S.R. Suitable hardy winter wheats have also been developed from time to time. Large scale intervarietal crossings of rye and of wheat are recommended as a preliminary to selection work.

648. 633.1:575(47.1)

MEURMAN, H. 633.1.0014(47.1)

Kevätviljakokeiden tulokset maatalouskoelaitoksen Puutarhaosastolla vv. 1927–1938. (**The results of spring grain trials at the Horticultural Department of the Agricultural Research stations, years 1927-1938**).

Valt. Maatalousk. Tiedon. 1939 : No. 165 : Pp. 30.

The results of variety trials with numerous Finnish and other varieties of oats, barley and wheat are described with a note on the lay-out and the statistical methods adopted.

The Tähti [= Star] oat gave the best yield and Voitto [= Victory] the next best.

Among the barleys, the Danish variety Binder which was the standard did best, with the Finnish strain No. 0135 as second best.

The best yielding spring wheat was the Svalöf variety Timantti [= Diamond].

649. 633.1:581.9(54)

FREISLEBEN, R. 633.1–1.524(43)

Die Gersten und Weizen der deutschen HinduKusch-Expedition 1935. (**The barleys and wheats of the German Hindu Kush Expedition 1935**).

Angew. Bot. 1940 : **22** : 105–32.

Wheat (with 849 seed samples) and barley (with 538) were predominant among the cultivated plants collected. Among the wheat material there were not less than 152 different morphological types and among the barley, 17 types.

Of the 17 types of barley, the commonest form of many-rowed barley, var. *pallidum*, was also most prevalent in the region covered by the Expedition. A form closely related to the main type was found which is probably a recent mutation of the prevailing *pallidum* type I and was named *Hordeum vulgare* var. *pallidum chitralicum* nov. subvar. In north India, type I was replaced by another with very lax ears, which on account of its thin and elastic stem is very resistant to lodging. Because of this and also its marked resistance to mildew and its early ripening, this form should be of value for breeding. The second important type group is the four-rowed naked barley of which there were two varieties, var. *coeleste* L. and var. *himalayense* Rittig, with bluish-grey grains. Of the six-rowed barleys, three types can be distinguished, var. *pyramidatum* Körn., var. *brachyatherum* Körn. and var. *parallelum* Körn.

Four different types of two-rowed *H. distichum* L. were found, var. *nutans* L., var. *nigricans* Körn., var. *medicum* Körn. and var. *nudum* Körn. Of the distribution of the two species, *H. vulgare* and *H. distichum*, it is noted that the former was found over the whole district covered by the Expedition but the latter was found only westwards from Afghanistan. *H. spontaneum* has a similar distribution.

The following sequence of events is suggested for the origin of cultivated barley. Unconscious selection of mutants with a tough rachis from a four-rowed form resembling *H. agriocrithon*, the distribution of the cultivated form so produced making for differentiation of varieties and forms. Then a hybridization with *H. spontaneum* and from this the development of many types including two-rowed forms with a tough rachis.

No representative of the diploid einkorn was found and only a few *turgidum*-like forms in some of the valleys of Nuristan.

Of the hexaploid wheats, *T. sphaerococcum*, though endemic in North India, was found only twice in the Punjab. *T. compactum* was found mostly as a winter form in many parts of Afghanistan.

In the classification of the 139 *vulgare* types it was seen that they represent an almost complete system of parallel variation. The gene centre theory is briefly discussed.

Finally the importance of the collection for breeding improved varieties is pointed out.

R. M. I.

650. Flaksberger, K. A. 633.11:001.4:578.08
**(On the question of the nomenclature of wheat varieties).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1940 : No. 2 : 18–19.

Some comments are addressed to plant breeders on the importance in naming new botanical forms or new varieties or strains of selecting suitable descriptive terms free from all ambiguity of meaning or association. Such ambiguities may occur when DC is used in U.S.A. to specify a wheat genus from a double cross, and in the U.S.S.R. to designate wheats that have originated from the plant breeding centre of Detskoe Selo (now known as Puškin), or when an adjectival place name, such as Kubanka, is adopted for a hard wheat and is subsequently selected to name a soft wheat as well.
Methods are suggested for indicating hybrid forms and local types. Preciseness of description is also highly important in plant nomenclature.
The use of Greek letters in the naming of strains is included among the several other undesirable practices prevalent in naming new plant forms.

651. Worzella, W. W. 633.11:575
**Some objectives in breeding for yield and other agronomic characters in wheat.**
J. Amer. Soc. Agron. 1941 : **33** : 174–80.

This article is the substance of a paper given at the annual meeting of the American Society of Agronomy. A general account is given of the present knowledge of the component parts of characters such as yield, winter hardiness and drought resistance. The importance to the plant breeder of a full analysis of such characters is stressed.

652. 633.11:575(47)
Kondratenko, F. 633.14:575(47)
**(Breeding winter crops at the Barnaul State Breeding Station).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1940 : No. 4 : 9–10.

The improved varieties produced include the winter wheats Elovka, very winter-hardy and productive, and Taežnaja, high yielding and resistant to rust and lodging. Forms of rye improved in hardiness and yield have been selected from the local populations, the most promising being Elovka, found as an impurity in the wheat of that name.
Mass hybridization has been carried out by emasculating a large number of ears of the most promising varieties and leaving them to open pollination.

653. Čanov, G. V. and
Kobel'kov, V. V. 633.11:575"793"(47)
**(Promising varieties of winter wheat).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1940 : No. 8–9 : p. 22.

Among the most promising varieties bred by the Gor'kii Plant Breeding Station are: Lutescens 2173/715, Erythrospermum 01811, Lutescens 01800 and Mariiskja Local (Lutescens). The first is a high yielding winter-hardy form that is resistant to diseases as well as to lodging. Erythrospermum 01811 is a selection characterized by high yield and baking quality above the average and is almost equal to the standard variety in frost resistance.
Lutescens 01800 is also high yielding with average baking quality and resistance to smut and frost.
Mariiskaja Local combines high yield with frost resistance and average baking quality.

654. Gugnin, Ja. E. 633.11:575"793"(47)
**(A new variety of winter wheat Lutescens 116).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1940 : No. 8–9 : 25–26.

The new variety, which was obtained by individual plant selection from a local wheat by the Falensk Breeding Station, is described. It is regarded as being specially suitable for northern regions and where the winter and spring conditions are severe owing either to

* See also Absts 608, 642 and 755.

frost, snow or sudden changes of temperature. It has given good yields and is resistant to lodging, only slightly susceptible to smut and being awnless, should be valuable as a fodder. The grain is small and of average baking quality.

655. Luneva, M. F. 633.11:575"793"(47)
**(New varieties of winter wheat of the Čakinsk State Breeding Station).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1940 : No. 8–9 : 20–21.

The main aims of the Čakinsk Station in regard to wheat breeding are the improvement of existing standard varieties and the production of new ones that are higher yielding, more resistant to winter conditions, lodging, diseases and pests and that give high quality grain. In this programme local varieties of hybrid winter wheat populations from another station and some plants from the Institute of Plant Industry were used as a basis for selection work. A number of new winter wheats have now been produced equal or superior to the former standard variety Lutescens 0329 in many respects and in addition drought resistant.

656. Pokhil', I. F. 633.11:575"793"(47)
**(The winter wheat Efremovka).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1940 : No. 8–9 : 22–23.

A description is given of this new early winter wheat and records are cited showing its superiority as regards yield, baking quality and resistance to fungous diseases and lodging. Its winter hardiness is average and it is considered that it could with advantage replace Zarja and Ukrainka in certain districts of the Ukraine.

657. Šestakov, V. E. 633.11:575"793"(47)
**(The winter wheat variety Hostianum 122/76).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1940 : No. 8–9 : 24–25.

This wheat was produced by the Petrovsk and Saratov stations from a cross between strain 0329 and 0237. In addition to good yielding capacity it also exhibits resistance to drought, lodging, diseases and Hessian fly. Its baking quality and loaf volume are also favourably mentioned.

658. Šulyndin, A. F. 633.11:575.114.061.6:575.3
**(Further notes on differences in first generation hybrids).**
Jarovizacija 1940 : No. 4 (31) : 104–05.

In the $F_1$ of two crosses between red and white grained wheats a certain number of white and intermediate coloured grains appeared. This is regarded as contrary to genetical expectation and as supporting Michurin's view that the expression of a character in the hybrid is determined by environmental influences. Slight differences in the proportions of white and red grains in reciprocal $F_2$'s are interpreted similarly.

659. Kostjučenko, I. A. 633.11:575.12:575.148
**(The question of organization and technique of intravarietal crossing in spring wheat).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1940 : No. 5 : 16–18.

Experiments are described in which it is shown that better results are obtained if the variety to be crossed is sown in two lots, one more dense or slightly later than the other, the lot which flowers first being emasculated and allowed to be pollinated by the other. Emasculation was distinctly more successful than cutting the florets.

660. Sorokin, K. A. 633.11:575.12:578.08
**(The influence of methods of emasculation and pollination of spring wheat on the set of grain and the 1,000 grain weight).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1940 : No. 6 : p. 13.

Cutting off the tips of the glumes had an adverse effect on the development of the grains and the resulting plants and made no corresponding improvement in the percentage set.

661. KHELEMSKII, A. V. 633.11:575.12:632.111–1.521.6
**(The quality as seed material and the winter hardiness of wheat regenerated by intravarietal crossing).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1940 : No. 8–9 : 38–39.
A brief record of findings from wheat crossing in support of Lysenko's well-known theory of the value of intra-varietal hybridization in renewing the good qualities of a variety, e.g. resistance to low temperature and the general effects of unfavourable environment.

662. KIRILENKO, M. K. 633.11:575.127.2(47)
**(Work on hybridizing wheat).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1940 : No. 5 : p. 28.
In the attempt to improve the *durum* wheat Akulovka it was used to pollinate Lutescens 062. Wide segregation occurred in the progeny but one constant form was found in the $F_3$, being identical with the $F_1$ and $F_2$; it was a form belonging to var. *velutinum*, awnless, with white, felted lax ears 12·7 cm. in length, red grain, semivitreous, with a 1000 grain weight of 32 grm. It has proved resistant to attacks of Hessian fly and frit fly, is as early as 062 and has surpassed both parents in yield.
Some of the other segregates were also promising.

663. TANAKA, M. 633.11:575.127.2:537.531
**(A method of rendering difficult interspecific crossing successful by means of X-rays).**
Bot. & Zool. 1937 : **5** : p. 1567.
Plants of spelt wheat were emasculated and when most spikelets had flowered the pistils were irradiated with X-rays for about 30 minutes and 5 hours later pollinated with pollen from untreated *T. Timopheevi* plants. Eleven seeds ($20{\cdot}37 \pm 5{\cdot}48\%$) )were obtained from 54 spikelets, whereas the control plots in exposed ground or in pots gave no set.
The possibility of X-ray treatment having weakened the inhibitory action of the stigmas of female plants with high chromosome number upon pollen germination of the male parent is suggested as an explanation of the success in crossing that follows irradiation.

664. ZAKHARŽEVSKII, A. A. 633.11:575.127.2:575.3
**(Overcoming sterility in hybrids *T. durum* x *T. Timopheevi*).**
Jarovizacija 1940 : No. 3 (30) : 90–105.
Hybrids of *T. durum* x *T. Timopheevi* were raised under particularly favourable conditions of growth and were found to be much more fertile than those raised in the open field. The same applied to the second and later generations. A large number of different varieties of *T. durum* were used in the crosses; the best hybrids were usually obtained when these were used as maternal parents.
Using these methods, a great variety of types was obtained in the $F_2$, including forms with black ears and a number of other characters not present in the parents. Most of these had grain of the cultivated type and only about 10% had brittle rachis. Many were highly resistant to black stem rust.
The $F_3$ contained a number of chlorophyll deficient seedlings. As many as 1422 mature $F_3$ plants were obtained however; some of them were of a type not represented in the $F_2$—e.g. forms with branched ears, double awns, etc. No forms of the pure *Timopheevi* type emerged; the proportion of sterile plants amounted to 14·6%. Over 70% of the $F_3$ plants exceeded the *T. durum* parent in yield, the highest yields being in the Turgidum group. One of the best of these was entirely free from *Puccinia graminis* and had only a 5% attack of *P. triticina*. Some 66% of the entire $F_3$ population were resistant to *P. graminis* and the author thinks there is no reason why combinations of this resistance and other desirable features should not be achieved.

665. ZHEBRAK, A. R. 633.11:575.127.2:576.356.5:581.04
**Experimental production of *Triticum polonicum* x *Tr. durum* amphidiploid through colchicine treatment.**
C. R. (Doklady) Acad. Sci. U.R.S.S. 1940 : **29** : 400–03.
*T. polonicum* and *T. durum* are both tetraploid wheats and produce a fertile hybrid. A Palestinian variety of *T. polonicum* was crossed with *T. durum* var. *melanopus* 069 and 23

hybrid grains were treated with 0·1% colchicine for 24 hours. Only two plants were obtained and one of them resembled the controls. The other produced an ear with a fertility equal to that of the control and other ears with much lower fertility. From the seeds on the ears of low fertility octoploid plants were raised. These were slower in development than the tetraploid controls, of a more intense green colour and with a much reduced fertility, the anthers being indehiscent at the beginning of the flowering period. The octoploids set 0·067 grains per spikelet by natural pollination and 0·49 by pollination with pollen of other species, while the controls set 2·78 grains per spikelet.

666. Zhebrak, A. R. 633.11:575.127.2:576.356.5:581.04

**Production of a *T. Timopheevi* x *T. durum* v. *hordeiforme* 010 amphidiploid by colchicine treatment.**

C. R. (Doklady) Acad. Sci. U.R.S.S. 1940 : **29** : 604–07.

From 992 pollinations on 5 pure lines of *Triticum Timopheevi* with *T. durum* var. *hordeiforme* 010, 342 hybrid kernels were obtained. Of these 271 were treated with 0·1% colchicine for periods of 6 to 35 hours and 82 mature plants were obtained. Among the spikes produced there were 12 which formed normal pollen and set a large number of grains; these may be considered amphidiploid. There were also 2273 spikes containing single kernels, some of which may also have been amphidiploid. Different types of chimerical spikes (diploid and amphidiploid tissue) were obtained.

Fertile plants were obtained in 1940 from the kernels from the amphidiploid spikes.

667. 633.11:575.127.2:581.162.5

Zhebrak, A. R. 633.11:576.356.5:581.04

**Comparative fertility of amphihaploid and amphidiploid hybrids *T. Timopheevi* x *T. durum* v. *hordeiforme* 010.**

C. R. (Doklady) Acad. Sci. U.R.S.S. 1941 : **30** : 54–56.

It having been shown by A. A. Drobkov that the fertility of *Triticum Timopheevi* is greatly dependent on the availability of boron and manganese an experiment was performed to see whether these elements were capable of improving the fertility of the hybrid *T. Timopheevi* x *T. durum* var. *hordeiforme* 010 to an extent comparable with the improvement produced by doubling the chromosomes.

Two amphidiploids produced by colchicine treatment of the hybrid seed were planted in the same box with two diploid hybrids and the soil was watered with a nutrient solution containing boron and manganese. The plants developed well and produced roughly the same number of spikelets, but whereas the amphidiploids produced an average of 1·35 grm. per spikelet, the diploid hybrids produced only 0·0029. It is concluded that while cultural conditions doubtless have a great influence on fertility, sterility due to genetic causes in hybrids between distantly related forms cannot be overcome by ordinary cultural conditions: conditions are required which induce chromosome doubling.

668. Oseledets, P. I. 633.11:575.127.5:633.14

**(An interspecific hybrid consisting of three species [preliminary communication]).**

Selektsija i Semenovodstvo (Breeding and Seed Growing) 1940 : No. 6 : 8–10.

A 47 chromosome hybrid was obtained from the cross $F_1$ (*Triticum vulgare* x *Secale*) x $F_4$ (*T. durum* and *T. vulgare*) and is thought to have been produced by the fertilization of an almost completely unreduced egg cell by a 21 chromosome pollen grain; it is therefore almost a trigenom hybrid, the pollen parent being a balanced 42 chromosome form with a considerable number of *T. durum* characters.

Another hybrid from the same cross had 45–52 chromosomes, its exact number not having been determined.

Both these triple hybrids showed heterosis in respect of vigour of growth; they resembled rye in certain characters such as pigmentation, pubescence around the leaf vagina and the procumbent habit; in leaf characters they resembled *T. durum*. The hybrid plants produced 80–92% of well filled pollen; the average number of grains per ear was 46, which is equivalent to 53·5% fertility, and 3,000 grains were obtained from the two plants. The grain was large and elongated, with a 1,000 grain weight of 41 grm., and intermediate in type between *T. durum* and *T. vulgare*.

The maximum number of univalents observed at first metaphase was 11; various meiotic irregularities occurred.

Three selections made from these hybrids have equalled the standard Lesostepka 074 in yield and surpassed such varieties as Ukrainka; they are white eared, free from shedding and resistant to lodging.

669. Paremud, L. Kh. 633.11:575.127.5:633.14
**(New forms of wheat-rye hybrids).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1940 : No. 4 : 4–5.
Crosses were made of *Triticum vulgare* and *T. durum* with *Secale cereale* and *S. montanum*, a number of varieties of each species being employed. The $F_1$ plants were very vigorous and disease resistant but were all self-sterile. They were pollinated with various balanced wheat-rye hybrids of intermediate type—i.e. 42, 56 or 28 chromosome forms. This gave rise to a number of new balanced intermediates, some of them derivatives of four distinct species.

670. Zhebrak, A. R. 633.11:575.129:581.162.5
**On the fertility of the amphidiploid hybrid of hard wheat with einkorn.**
C. R. (Doklady) Acad. Sci. U.R.S.S. 1940 : **29** : 480–82.
The parental form of *Triticum durum* produced an average of 2·7 grains per spikelet. The *T. monococcum* form had one flower and therefore one grain per spikelet. The 22 amphidiploids produced an average of 1·7 grains per spikelet and were thus intermediate between the parents. The amphidiploids produced more tillers than *T. durum* and less than *T. monococcum*. Meiosis was not studied in the amphidiploids, but the occurrence of empty spikelets and some empty seed suggests that it was not completely regular.
The immunity of the amphidiploid *T. durum* x *T. monococcum*, coupled with a productivity approaching that of *T. durum* makes it of interest to the practical breeder.

671. Vinogradova, E. I. 633.11:575.22:631.521.5
**(Variability of varietal characters in wheats).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1940 : No. 2 : 37–38.
A further article (cf. "Plant Breeding Abstracts", Vol. IX, Abst. 688) on the need for allowing variability in varieties of wheat that are being examined for certification.
It is essential that the possible existence of variants of diagnostic characters should be recognized and properly investigated when they arise.
Instances of the occurrence of such variations arising from environmental effects or mutation are exemplified from observations on the wheat Djurabl' [= Durable].

672. Šimanskii, N. K. 633.11:575.3:575"793"
**(Controlled conversion of the nature of the spring wheat Erythrospermum 1160 into winter wheat).**
Jarovizacija 1940 : No. 4 (31) : 25–29.
About 2 kg. of seed of the spring wheat Erythrospermum 1160 were winter sown in 1935. The majority of the plants survived and produced ears. Seed from these plants was again sown in autumn, together with seed from spring sown plants as a control. The experimental plants were more varied in type but survived better. The experiment was repeated and again the survival of the experimental plants was much higher than that of the controls, which died out almost completely; the tillering, height, size of ear and frost resistance were also greater. Various plants different in type from the original *Erythrospermum* appeared in the progeny, whilst plants with pubescent seedlings disappeared altogether in the third generation. When grown at temperatures of +17 to +25° C. the "modified" form was delayed in earing and behaved therefore as a true winter wheat.

673. Krotov, A. S. 633.11:575.42
**(Selection as a method of improving self-pollinated plants).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1940 : No. 5 : 6–9.
By repeated selection within the wheat variety TZA/32 lines varying in yield were obtained, the best being 30–40% above the standard, the worst 20% below. Similar differences were observed in 1,000 grain weight and in resistance to smut, frit fly and *Chlorops taeniopus* Meig. and in protein content. Analogous results with a number of other varieties are reported.
A mixture of the best lines of TZA/32 was made and yielded considerably more grain than the control.

674. 633.11:576.356
ARARATJAN, A. G. 633.16:576.356
Über die Meiosis zweier Getreidearten. (**On the meiosis of two cereal species**).
C. R. (Doklady) Acad. Sci. U.R.S.S. 1940 : **28** : 645–48.

In one bud of *Triticum Urartu* an abnormal type of meiosis was found in which the second metaphase chromosomes were much less contracted than usual and bodies resembling centrosomes occurred. In *Hordeum spontaneum* about 5–10% of the cells showed irregularities of meiosis, most frequent being what the author interprets as lagging or precession at anaphase, but including also scattering of the chromosomes at anaphase, cell inclusions, long chromosomes and chromosomes with threadlike appendages.

675. *LOMEJKO, S. 633.11:581.142:631.521.6:575(49.7)
**(Maturation of the grain of winter wheat after harvesting—Results of an investigation with pedigree varieties at the Breeding Station in Zemun).**
Arhiv. Minist. Poljopr. 1937 : **4** : No. 8 : 88–108.

This paper, which contains a survey of relevant literature and records of actual experiments at Zemun Breeding Station forms a contribution to the study of germination in the ear in wheats grown in Jugoslavia and in other parts of Europe.
A preliminary experiment with wheats from various countries showed: that winter wheats at the milk ripe stage exhibit varietal differences in germination capacity; germination in white grained varieties in much higher than in red grained ones, though transition forms as regards germination exist and quite irrespectively of grain colour; varieties of the *nigro-erythrospermum* group all appear to have the same germination capacity, which is much higher than that of other varieties with red grain. Nilsson-Ehle's multiple factor theory for red and white grain colour could be applied to explain some apparent anomalies in the behaviour of the experimental varieties.
The main experiment, which was made with 57 of the best of the Zemun Station wheats representing numerous botanical varieties from all over Jugoslavia, gave the following results:
Provenance and botanical variety are not connected with germination in the ear.
Red grained and white grained forms differ in the defect in question. It is tentatively suggested that the low germination and long maturation period (over 60 days) found in certain varieties with pale red grain e.g. No. 55 (*caesium*)] may be due to the operation of some unknown internal factors (genes).
The course of maturation was also studied as well as germination at low temperatures and under natural conditions.
Germination at the milk ripe stage occurs only in exceptional cases in white grained wheats and very rarely in red grained ones.
In view of the independence of time of ripening and other useful characters, it should be possible by systematic selection and crossing to create new varieties resistant to the defect.

676. DEREVITSKII, N. F. 633.11:581.162.32
**(The technique of crossing wheat by means of wind pollination).**
Selektsija i Smenovodstvo (Breeding and Seed Growing) 1940 : No. 5 : p. 15.

To utilize the capacity for selective fertilization maternal plants are now sown in an isolated plot surrounded by a mixture of all varieties considered promising as pollen parents. Small sections of each row of plants are mown down at successive intervals so as to give a range of flowering dates in both maternal and pollen parents. As each section of the mother plants comes into ear they are emasculated and left to open-pollination, thus giving the maximum possibility of getting combinations between all parents.
This method is regarded as particularly suitable for making crosses between winter and spring forms.

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* An extended summary of this paper is on file at the Bureau.

677. Horovitz, N. 633.11:582(82)
Algunas características de variedades de trigo. Observaciones hechas en los años 1937 y 1938, en la colección de especies y variedades de la Estación Experimental de Pergamino. (**Certain characteristics of wheat varieties. Observations made in the years 1937 and 1938 on the collection of species and varieties of the Pergamino Experimental Station**).
Publ. Minist. Agric. Nac., Estac. Exp. Pergamino 1939 : No. 3 : Pp. 22; also "Granos" Semilla Selecta, B. Aires 1939 : 3 : No. 6 : 3–22.

Observations were made on the ear characters, plant habit, vegetation period and resistance to lodging, shedding, frost, *Puccinia glumarum*, *P. triticina*, *P. graminis* and *Ustilago tritici*. Some of the local wheats were much more resistant to *P. triticina* than any of the imported varieties, Sinvalocho M.A. and Klein-Titán being free from attack in both years.

678. Ryžei, I. P. 633.11–1.524(47)
(**Work on breeding winter wheat at the Kirgiz Breeding Station**).
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1940 : No. 7 : 31–32.

A thorough study has been made of the local wheats. The characteristics such as yield, hectolitre weight, 1,000 grain weight, vitreousness, protein and gluten content, baking quality, lodging, shedding and smut resistance are tabulated for some of the main botanical varieties. The vast majority of forms are of the *rigidum* type. Some very promising selections with high baking quality and resistance to smut have been made.

679. Bayles, B. B. and
Taylor, J. W. 633.11–2–1.521.6(73)
**Report of the uniform soft winter wheat nurseries 1938-39.**
Div. Cereal Crops and Diseases, Bur. Pl. Ind. U.S. Dep. Agric. 1940 : March 7 : Pp. 11. (Mimeographed).

In this seventh annual report of the soft winter wheat nurseries, data are given for the winter survival, yield, date of heading, plant height, lodging, test weight and reaction to leaf rust, loose smut and stinking smut of thirty standard varieties. Seven varieties grown in the previous six years were discontinued in 1939 and seven new varieties—Purdue No. 4, Early Premium, Canawa, Yorkwin, Clarkan, Thorne and Brill—were included for the first time. Minhardi, Minturki and similar varieties appear to be the most resistant to low temperatures. Several of the newer varieties, including Yorkwin and Thorne, produced high average yields. American Banner, Canawa, Thorne, Baldrock, Gladden and Yorkwin have stiff straw and showed relatively little lodging. Mediterranean selection, Kawvale, Illinois No. 2, Brill and Purkof showed some resistance to stem rust. Kawvale showed low infection when artificially infected with loose smut and some lines of Leap are also highly resistant. Only Minturki has enough resistance to bunt to be of any value in a breeding programme. The semihard strains Hope-Hussar (C.I. 11682), Hope-Mediterranean (C.I. 11763) and Red Rock-Hope (C.I. 11821) are resistant to both leaf and stem rust.

680. Širkevič, E. I. 633.11–2.111–1.521.6(47)
(**Breeding winter wheat at the Kamalinsk State Breeding Station**).
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1940 : No. 4 : 8–9.

Attempts to produce winter-hardy varieties suitable for winter sowing in Siberia have been made by selection among the local wheats Kazačinskaja and Ingašskaja and also among various hybrids made with this end in view.

681. Saprygina, E. S. 633.11–2.111–1.521.6:575:578.08
(**The use of natural cold in breeding winter cereals**).
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1940 : No. 8–9 : 13–16.

This article, which deals extensively with questions of technique, records too the author's success in determining the cold resistance of a number of winter wheats and some of their hybrid progeny, grown in pots and subjected to the effects of natural low temperature. Some of the hybrid material represented $F_3$ and $F_4$ generations. The results were confirmed by the findings in field tests with the same wheats.
Among the hybrids the most resistant was Kooperatorka x Lutescens 0329 with a survival

percentage of 83 plants at −17° C. The least resistant hybrid was Strain 0841 x Lutescens 0329 which showed 17% survival at the same temperature.
As a means of hastening breeding operations the author recommends his technique for all breeding stations and variety trial centres especially in climatically suitable districts. The use of pots is recommended where the supply of seed for testing is small.

682. Kneen, E. and Blish, M. J. 633.11–2.111–1.521.6:578.08
**Carbohydrate metabolism and winter hardiness of wheat.**
J. Agric. Res. 1941 : **62** : 1–26.

During and after controlled hardening and dehardening of young plants of six winter wheat varieties, determinations were made of dry matter, sucrose and glucose content and were considered in relation to survival in freezing tests. Increasing dry matter and sucrose were correlated with increasing cold resistance, but glucose content did not show this relation.
In regard to varietal differences in hardiness, crown content was a much better index than leaf content. The varieties showed differences in maximum cold resistance and differences in resistance to dehardening.

683. Saltykovsky, M. I. and Saprygina, E. S. 633.11–2.111–1.521.6:578.08
**A method for determination of cold-resistance of winter cereals.**
C. R. (Doklady) Acad. Sci. U.R.S.S. 1940 : **28** : 544–47.

Winter wheat plants are lifted towards the end of autumn, before the soil is frozen, and stored either in bunches of 50 or in slightly dried soil, at about −8° C. during the first half of winter and −5° C. during the second. In this way they can be maintained throughout the winter in a healthy condition and without losing the resistance acquired through autumn hardening.
To test their resistance the plants are subjected to injurious temperatures, either in freezing chambers or in the open, then covered with snow and thawed out in a warm room. They are then planted out in soil, without leaves and the survival observed.
The results obtained by this method agree substantially with those obtained by freezing autumn sown plants in boxes or by covering field plots with ice. With artificial mixtures of hardy and less hardy varieties it was possible to eliminate completely the less hardy variety using a freezing temperature of −16° C.

684. Krasovsky, I. 633.11–2.112–1.521.6
(**Effect of conditions at time of setting and ripening of seeds on the drought resistance of wheat**).
Bull. Acad. Sci. U.R.S.S. Sér. Biol. 1940 : No. 4 : 495–503.

At the State Breeding Station at Gor'kii preliminary experiments have been made of the effect of drought acting on parent plants of spring wheat upon the drought resistance of their progeny.
In most cases the drought resistance (i.e. yield of the progeny under conditions of drought) was increased in individuals derived from parents that had grown in arid environment.
The later the drought acted upon the parents the more the drought resistance increased in the seed generation, this effect being most marked when the parent plant was acted upon at the time when the embryo was beginning to develop and the grain was beginning to fill.
Not only the mere action of drought on the maternal plant, but also its intensity is important in determining its effects and it appears that recurrent drought two years in succession may not only increase the resistance in the progeny but may decrease it, even killing them off.
Selection of good strong ears for plants growing in an arid environment should, it seems, produce more drought resistant plants and the possible value of such mass selection of the best ears in drought years and localities seems worth further investigation as a means of increasing the drought resistance of varieties.

685. Tumanian, N. G. 633.11–2.451.2:575.2
Über die Rolle des *Ustilago* bei der Formbildung der Weizen und seine Bedeutung für die Selektion. (**On the role of *Ustilago* in the creation of forms of wheat and its significance for breeding work**).
C. R. (Doklady) Acad. Sci. U.R.S.S. 1941 : **30** : 172–74.

In the progeny of hard wheats ($2n = 28$) infected with *Ustilago*, it is claimed that widely variant types arose, including soft wheats ($2n = 42$) and in one case aneuploid forms ($2n = 31$ and 37).

686. Zazhurilo, V. K. and
Sitnikova, G. M. 633.11–2.8–1.521:6:575
**Natural ways of transmission of the winter wheat mosaic virus.**
C. R. (Doklady) Acad. Sci. U.R.S.S. 1940 : **29** : 429–32.

Since winter wheat is more severely attacked by mosaic and since it provides the infection which is transferred to spring wheat by the insect vector (*Deltocephalus striatus* L.) the plant breeder is recommended to concentrate his attention on the development of resistant winter wheats.

687. 633.11.0014(47.1)
Meurman, H. 633.14.0014(47.1)
Syysviljakokeiden tulokset maatalouskoelaitoksen puutarhaosastolla vv. 1931–1937. (**The results of autumn cultivation trials at the Horticultural Department of the Agricultural Research Station years 1931-1937**).
Valt. Maatalousk. Tiedon. 1938 : No. 149 : Pp. 19.

Several Finnish varieties of autumn wheat and rye were included in these trials in which yield, winter-hardiness, stiffness of straw, length of vegetative period, etc., were recorded. The wheats Jarl and Sampo gave the best average yields, whilst among the ryes, Outoisten [= Strange] had the highest average yield.
Linhard's method of computing experimental errors was used.

## OATS 633.13*

688. Hayes, H. K. 633.13:575:631.557
**Breeding for resistance to crown rust, stem rust, smut, and desirable agronomic characters in crosses between Bond, *Avena byzantina*, and cultivated varieties of *Avena sativa*.**
J. Amer. Soc. Agron. 1941 : **33** : 164–73.

Details are given of tillering, yield, bushel weight and other agronomic characters of Bond (a variety which has high resistance to crown rust), of cultivated *sativa* varieties and of selections obtained in Minnesota from crosses between Bond and these varieties. The inheritance of disease resistance and of *sativa vs byzantina* characters has been previously reported (cf. "Plant Breeding Abstracts", Vol. X, Abst. 414). The selections used in the present investigation had been first selected for disease resistance and then for desirable agronomic characters. They were $F_5$ to $F_7$ generations. The results indicate that the selections from the Bond crosses are superior in tillering ability on the average to the *sativa* varieties of oats considered to be adapted to Minnesota. There was little or no relation between tillering in rod rows and in individual spaced plants. The yield trials indicated that many of the selections from the Bond crosses had outstanding yielding ability. One of the favourable characters of Bond is the plump kernel and high weight per bushel. Many of the selections were equal to the Bond parent in average weight per bushel. Bond is also outstanding in its ability to withstand lodging and selected strains from the crosses were equal to Bond in their resistance to lodging. An undesirable character in Bond is a decided tendency to "secondary growth" and many of the selections also showed this character. The red colour of the grain of Bond oats is also undesirable. Many of the hybrids had reddish grains but others bred true for white or yellow grain colour. The results thus suggest that Bond is a desirable parent in crosses with *sativa* varieties as in addition to its resistance to crown rust it has good combining ability.

689. Hayes, H. K.,
Moore, M. B. and 633.13:575.127.2:575.11
Stakman, E. C. 633.13–2.45–1.521.6:575.11
**Studies of inheritance in crosses between Bond, *Avena byzantina*, and varieties of *A. sativa*.**
Tech. Bull. Univ. Minn. Agric. Exp. Sta. 1939 : No. 137 : Pp. 38.

The material studied consisted of crosses between Bond (*A. byzantina*) and several *A. sativa* varieties (including Anthony, Iogold and Rainbow) and two selections (Double Crosses A and B) from crosses of (Minota x White Russian) x Black Mesdag. Bond is highly resistant to crown rust and susceptible to stem rust while the *sativa* varieties used in the crosses were

* See also Absts 607 and 755.

susceptible to crown rust but resistant to stem rust. The $F_1$ plants were resistant to stem rust and also resistant or semi-resistant to crown rust. The $F_2$ generation of the cross Bond x Rainbow approached a ratio of 3 resistant to crown rust : 1 susceptible while the other crosses gave ratios of 9 resistant : 7 susceptible. $F_2$ and $F_3$ segregations suggested that stem-rust resistance was due to a single dominant factor. Bond and Double Crosses A and B proved resistant to the smuts (both loose and covered), the Double Crosses having received their resistance from the Black Mesdag parent. In the cross between Bond and Double Cross A some susceptible lines were obtained in the $F_3$—this suggests that the two parents contain different factors for smut resistance. There were indications of a single major factor difference for smut resistance in the crosses of Bond with Iogold and Anthony. Spikelet disarticulation, manner of floret disjunction, development of hairs on the base of the lower floret, awn development, plumpness of seed and plant vigour were also studied in the crosses. The *sativa* type of floret abscission appeared to be dominant to the *byzantina* type (called disarticulation) and 3 : 1 ratios were found in the $F_2$'s. The *sativa* varieties showed floret disjunction by disarticulation at the apex of the rachilla segment and the Bond parent showed disjunction by basifracture. The Double Crosses probably had an intermediate type of floret disjunction. Segregations for different types of floret disjunction were explained on the basis of a single major factor difference in the crosses Bond x the two Double Crosses, but in the crosses Bond x other *sativa* varieties more than a single factor is involved. $F_2$ segregations for type of basal hairs in the crosses Bond x *sativa* varieties approached ratios of 3 *sativa* type (few basal hairs) : 1 Bond type (heavy growth of basal hairs). An accurate analysis of the inheritance of awn development was not possible. Weak awns appear to be dominant over strong awns. The Bond parent had very plump seeds and it was found possible to transfer this character to $F_2$ plants which were classified as typical *A. sativa.* A study was also made of the independence or association of characters in the $F_2$ generations. The two characters spikelet disarticulation and floret disjunction, which are commonly used for differentiating *A. byzantina* and *A. sativa*, were found to be linked. Finally it is pointed out that it should be relatively easy to combine resistance to the three major diseases (stem rust, crown rust and the smuts) with the cultivated *sativa* characters and the plumpness of grain found in Bond.

690. Troitskaja, E. 633.13:575.42(47)
**(The black oat Džety-su).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1940 : No. 2 : 25–26.

The merits of the black oat as a cereal and for breeding purposes are outlined and the botanical characters and economic qualities of the strain Džety-su selected from a mixed population of black oats are enumerated. This oat is resistant to drought, lodging, shedding, fungous and insect pests; it is tolerant of salty soils and sharp changes in temperature and is suitable for sowing for cutting as hay and in mixtures with legumes, etc. The desirable qualities of the grain include high protein content and a low fat content which ensures good keeping properties. The variety is regarded as very promising for hybridization operations.

## RYE 633.14*

691. Breslavetz, L. P. 633.14:576.356.5:581.04
**Polyploid forms of spring rye.**
C. R. (Doklady) Acad. Sci. U.R.S.S. 1940 : **29** : 328–31.

Polyploid plants of spring rye were produced by treating seeds from two to five days with 0·02 and 0·04% colchicine solutions. In addition to tetraploids ($2n = 28$) there were obtained a triploid and an octoploid. The octoploid did not survive. The first leaves of the abnormal plants were wide and thick, the second leaves narrow and the third and fourth of normal width. Increase in chromosome number was accompanied by increase in cell size, both stoma guard cells and root tip cells, and with an increase in seed size and weight. It did not affect self-sterility.

692. Khačaturov, S. P. 633.14:581.162.32
**(The inheritance of the capacity for selective fertilization in gametes on fertilization).**
Jarovizacija 1940 : No. 4 (31) : 21–24.

Four rye varieties, one with green grains and three with yellow grains, a dominant character,

* See also Abst. 755.

were planted in alternate rows. The proportion of yellow grains produced by the green variety varied in different plants, from 0% to 71%.
In the following year the progeny of each plant was sown separately, the green grains being also sown apart from the yellow. The lines which gave no out-pollination in the first year again gave little or none and those with a high percentage in the first year were again high in the second year. The lines are therefore thought to possess hereditary differences in selective capacity for different sorts of pollen. It ought thus to be possible to select types which even in propinquity with the other varieties do not lose their purity.

693. ŠČERBINA, D. R. 633.14:581.162:32
**(The influence of artificial supplementary pollination on the quality of the seed of winter rye).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1940 : No. 5 : 13–14.

By artificially agitating rye at the time of flowering the proportion of sterile grains was reduced from 12·23 to 7·62%, the 1,000 grain weight was raised by 3 grm. and the number of small or shrunken grains was more than halved. The protein content of the grain was also increased.
Further experiments on the same lines showed a yield from the pollinated plants of 13·6 c. per ha. as opposed to 11·3 from the controls.

694. KOLOKOLOV, K. V. 633.14–1.524(47)
**(The local variety of rye "Manyč").**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1940 : No. 8–9 : p. 26.

Manyč or "Manyčeskaja", a winter rye grown in the Kalmuck region, is recommended for its yield, grain and flour characters and its relatively high resistance to shedding.

## MAIZE 633.15*

695. BASCIALLI, P. C. 633.15:575(82)
El maiz Colorado Manfredi M.A. Su origen, historia y valor agrícola. **(The maize Colorado Manfredi M.A. Its origin, history and agricultural value).**
"Granos" Semilla Selecta, B. Aires 1939 : **3** : No. 9 : 3–8.

A drought of intense severity was the occasion of testing a number of maize selections in 1928. All the selections from Casilda and Cuarentón Colorado succumbed, but a number of selections of the type Piamontés Colorado made from local populations survived admirably. These plants were selfed and the progeny emasculated in propinquity with selected Casilda selfs. The $F_1$ was open pollinated and the progeny subjected to further selection over a number of generations, the type sought for being early, vigorous, with two cobs and free from side tillers and smut. The product of multiplication was sown in various localities with good results. The variety has a wide range of adaptation and is vigorous, the male flowers appear some 60–65 days from germination and the female 3–5 days later; it is a very abundant pollen producer; the cob is borne about 0·9 to 1 m. from the ground, the average number being 150 per 100 plants; the cobs are heavy, with 12 rows of 40–44 grains each, the grain weighing 140–145 grm.; the stalk is small, 15–16% of the weight of the cob. The grains are of the flint type, reddish and horny, with a thousand grain weight of 282 grm.; their early maturity frequently enables them to escape locust attack; full maturity is reached 130–135 days from germination or even earlier.
Average yields of 3260 kg. per ha. were obtained in 1935/36 in wide scale tests, which is 14% more than the official standard variety Colorado Casilda. Increases of 3% and 10% respectively were registered in the two subsequent years. The variety is everywhere pronounced more drought-resistant than the existing varieties and is in growing demand.

696. 633.15:575.12
**Hybrid corn.**
Science 1941 : **93** : p. 10 (Suppl.).

A brief item recording that hybrid maize is now being planted on 25,000,000 acres in the 12 States of the Corn Belt in the U.S.A. This is more than half the maize acreage in these States. In Iowa 88% of the maize acreage was planted to hybrid maize in 1940.

* See also Absts 607, 612 and 614.

697. Sokolov, B. P. 633.15:575.12:631.557(47)
**(Maize hybrids of the Dnepropetrovsk State Breeding Station).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1940 : No. 3 : 27–30.

Work for some years at the Dnepropetrovsk Plant Breeding Station has included a study of 250 varietal combinations made with the object of utilizing hybrid vigour to obtain high yields. The results have shown that not every combination of varieties gives an increased yield in the $F_1$ as compared with the parent or the standard varieties. Out of 24 combinations only 40% showed a higher yield than the standards.
The best crosses were those in which both parents or one were a standard variety. Some of the highest yields were obtained from the hybrids Brown County x Gruševskaja and Gruševskaja x Sterling and especially from crosses between the following selfed lines: Stepnjak (BG–1), Dnepropetrovsk (GS–1) and Progress (GS–2).
Other stations are also engaged in the production of such hybrid forms.
The most suitable method of producing $F_1$ seed on a large scale is discussed.

698. Spencer, J. T. 633.15:575.125:581.43
**A comparative study of the seasonal root development of some inbred lines and hybrids of maize.**
J. Agric. Res. 1940 : **61** : 521–38.

The root systems of four inbred lines (56, 4–8, 51 and 84), of two single crosses (56 x 4–8 and 51 x 84) and of the double cross from these two single crosses were studied throughout the growing season. The four inbred lines studied are at present being widely used in Ohio in the commercial production of hybrid maize seed. The seminal roots of the hybrids showed marked hybrid vigour. The seminal root system was only active for about 3 weeks. There was no correlation between the sizes of the seminal and crown root systems. The crown roots began a rapid growth soon after germination and in a short time far surpassed the seminal roots in dry weight. When fully developed the largest root system (56 x 4–8) was twice the dry weight of the root system of the largest inbred line (4–8) and four times that of the root system of the smallest inbred line (51). The double cross was very similar to the single cross 56 x 4–8. A differential seasonal response seems to occur in the inbred lines. The total lengths of the main roots, the root development at different nodes and the top : root ratios were also determined. The force required to pull a plant out of the soil was also determined and a significant correlation was found between pulling resistance and root weight. There were no significant correlations between pulling resistance and number of main roots.

699. 633.15:581.162.3
Hadjinov, M. I. 575.148:575.12
**Selective fertilization in maize when pollinated with a pollen mixture.**
C. R. (Doklady) Acad. Sci. U.R.S.S. 1940 : **29** : 410–14.

A series of reciprocal pollinations of pairs of varieties or lines with mixed pollen was made, so designed that endosperm characters could be used to determine the frequency of fertilization by like and unlike pollen. Out of 27 combinations only 9 showed preference for unlike pollen and the deviations were small; 18 showed preference for like pollen and the deviations in some cases were large.
To test the hypothesis that selective fertilization affects the vigour of the progeny two parallel experiments of this type were set up. In the first a single plant of each of two varieties was used, the same plant functioning as both seed and pollen parent; in the second, pollen was taken from a number of plants. In neither experiment was there evidence of selective fertilization. Since in the first experiment fertilization by like pollen was in fact selfing and therefore likely to produce less vigorous offspring than fertilization by unlike pollen, it appears that there was no connexion between selective fertilization and vigour of progeny.

700. Lesik, I. L. 633.15:581.162.3
**(Capacity for selective fertilization in maize).**
Jarovizacija 1940 : No. 4 (31) : 105–06.

Twenty varieties of yellow and white grained maize were planted in alternation in such a way that each yellow variety was surrounded by white plants each at a distance of 60 cm., and each yellow surrounded by whites. Nevertheless the cobs of the white grained varieties contained less than 10% of yellow grains. The proportion varied in different varieties, being less than

1% in some. The distance of 800 or 600 m. prescribed for spatial isolation is therefore thought to be excessive.

701. Kravčenko, S. K. 633.15:581.162.32
**(Questions of intervarietal cross-pollination in maize).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1940 : No. 5 : 11–13.

The author remarks upon the length of time that some maize varieties have remained pure without special precautions having been taken to ensure against out-pollination. To test the point 12 maize varieties were sown in juxtaposition, 2 rows of each. The cobs of some of the varieties showed no signs of xenia whatever; the characters of some of these were however clearly detectable in the cobs of certain other varieties, while some apparently gave little cross-pollination. The same effects were observed in the progenies of the cobs from different varieties. The differences were not correlated with the time of flowering and are ascribed to selective fertilization; it is further concluded that the success of a given cross may depend upon which variety is used as maternal and which as pollen parent when using the method of natural pollination.

702. Salamov, A. B. 633.15:581.162.32
**(On the spatial isolation of maize).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1940 : No. 3 : 25–27.

Examining the results of numerous experiments made in the U.S.S.R. on spatial isolation of maize, the writer urges that the 800 metres (or 600 metres) officially fixed in the U.S.S.R. as the spacing required between varieties of maize growing in proximity to each other is excessive and that the whole question should be again reviewed so that limits suitable for the different regions of the U.S.S.R. could be fixed.

With certain provisos, the writer regards 200–300 metres as adequate spacing for the maize regions of the northern Caucasus.

703. Elliott, C. 633.15–2.3–1.521.6
**Bacterial wilt of dent corn.**
Phytopathology 1941 : **31** : 7–8. (Abst.).

At Arlington Farm, Virginia, between 800 and 900 inbred lines of dent maize have been tested for resistance to bacterial wilt, which has caused severe losses in new hybrids of this type in the Middle West. Most lines are more susceptible in the later stages of growth and inoculations of young plants are not considered to give reliable indications of resistance to leaf blight, which is the important phase of this disease in dent maize in the field.

704. Huber, L. L. and
Stringfield, G. H. 633.15–2.7–1.521.6:519.241.1
**Strain susceptibility to the European corn-borer and the corn-leaf aphid in maize.**
Science 1940 : **92** : p. 172.

Differential susceptibilities of maize strains to the European corn-borer (*Pyrausta nubilalis*) have been recognized for several years. Differential susceptibilities to the corn-leaf aphid (*Aphis maidis*) have now been found and high and significant correlation coefficients for borer and aphis infection have also been obtained. Since counts of aphid colonies can be made much more rapidly than can estimates of resistance to borer, it is suggested that degree of aphid infestation is useful as a preliminary index of strain susceptibility to corn-borer.

## BARLEY 633.16*

705. Broekema, C. 633.16:575(49.2)
Inleiding. **(Introduction).**
4th Jb. NaCoBrouw. Wageningen 1938 : 3–11.

The National Committee for Brewing (NaCoBrouw) is one of the Dutch associations formed for the improvement of a particular crop—in this instance barley—by co-operative effort between representatives of all scientific and industrial and agricultural research bodies as well as individual workers concerned with barley production. The scope and value of the work of

* See also Absts 607, 608 and 612.

this Committee and its organization, co-ordination and potential development are discussed. The main programme of research is concentrated on problems of barley varieties and local forms, yield, quality, grain size and chemical composition, disease resistance, quality of the final product, differences in experimental technique, etc.

706. Wiebe, G. A. 633.16:575:581.6(73)
**Some problems in breeding barley for industrial uses.**
Brew. Dig. N.Y. 1940 : **15** (11) : 43–45.

This brief, popular exposition of the breeding of malting barley points out the need for a clear definition of quality, for extensive collection of material and for intensive study of parents. The breeding procedure is briefly described, and two new American varieties are mentioned. They are Campana, a two-rowed variety intended to replace Horn on the dry lands of Montana, and Beecher, a six-rowed barley for western Kansas, western Nebraska and eastern Colorado. In breeding barley agronomic features and resistance to the different adverse factors have to be considered as well as quality. Breeding work on malting barleys was interrupted in the U.S.A. by prohibition. It is now a joint activity of the United States Department of Agriculture, State Experiment Stations, Barley Improvement Council, U.S. Maltsters' Association and Malt Research Institute. The regional laboratory is at Madison, Wisconsin.

707. Gudkov, A. N. 633.16:575.061.6:578.088
(**Determination of the colour of barley seeds by chemical methods**).
Selektsija i Smenovodstvo (Breeding and Seed Growing) 1940 : No. 6 : p. 32.

A 15% solution of HCl produces a coloration in unripe grains of varieties whose ripe grain is pigmented but not in unpigmented varieties.

708. Robertson, D. W., Wiebe, G. A. and Immer, F. R. 633.16:575.116.1 633.16:576.356.5
**A summary of linkage studies in barley.**
J. Amer. Soc. Agron. 1941 : **33** : 47–64.

Lists are given, with authorities, of (1) the genetic factors studied by workers in barley genetics with recommended symbols and the symbols previously used; (2) reported linkages and associations, by pairs of characters and classified in linkage groups; (3) characters showing independent inheritance. A brief list of 10 tetraploids, a haploid and a trisomic is also given.

709. Šul'ga, P. M. 633.16:575.12:575.148
(**Raising the percentage of fertilization in barley**).
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1940 : No. 5 : 24–25.

Experiments showed the necessity for removing the leaf sheath immediately after emasculation, as otherwise a marked reduction in the percentage set ensues.

710. Judin, A. F. 633.16:575.3:581.48
(**Continuation of the work of converting hulled barleys into naked barley**).
Jarovizacija 1940 : No. 3 (30) : 207–09.

By repeated selection in a number of varieties grown under intensive conditions a marked increase was effected in the 1,000 grain weight, in the vigour of growth and number of nodes, in the length of ear and consequently in the number of grains per ear; the amount of the husk that was free from the grain rose with selection and in the third year many grains were quite free. The number of ovaries and stamens per floret also rose, this being associated with a rise in the number of grains and a tendency towards grain development in the lateral florets of two-rowed forms.

Some varieties were affected more quickly than others.

711. Freisleben, R. 633.16:576.16(5)
Die phylogenetische Bedeutung asiatischer Gersten. (**The phylogenetic importance of Asiatic barleys**).
Züchter 1940 : **12** : 257–72.

As a result of the investigations made by the Hindu Kush Expedition, it is stated that the origin of the two-rowed barleys, unlike that of the many-rowed forms, is not to be sought in the Interior of Asia, but the possibilities of the two following solutions are discussed:—

(1) a completely separated, polyphyletic origin of the two and many-rowed barleys in the region of their corresponding wild species; (2) hybridization between the many-rowed, cultivated barleys and *H. spontaneum* by the advancement of the latter to the west of the Hindu Kush district.
The discovery by the expedition of a plant with a brittle rachis, heterozygous for brittleness and number of rows and of the following combinations among the progeny—brittle two-rowed, brittle four-rowed, not-brittle two-rowed and not-brittle four-rowed—is concrete evidence for the probability of the second solution.
It may also therefore be assumed that *H. distichon* has originated by hybridization from *H. vulgare* x *H. spontaneum.*
It is also stated that it must be assumed that the barley first brought into cultivation was a form of *H. agriocrithon* and that brittleness was gradually lost by selection. The form of *H. vulgare* thus produced was probably introduced into the *H. spontaneum* district and hybridization resulted.
Finally, a study is made of the geographical distribution of certain definite characteristics, i.e. naked and hulled grain; testa and glumes with and without anthocyanin; endosperm with and without anthocyanin; lemmas with awns or hoods; lemmas with long or short awns or unawned; all spikelets with awns of about equal length or lateral spikelets with shorter awns or without awns; ears very dense (6-rowed) or medium dense to lax (4-rowed); stems long or short.
That the independent origin of the same characters is possible, is shown by the study of endemic forms. Two found in Afghanistan and Chitral have been described by Vavilov and Bukinich (var. *sublatiglumatum* and var. *afghanicum*) and one found among the material of the Hindu Kush Expedition (var. *chitralicum*). R. M. I.

712. Karpechenko, G. D. 633.16:576.356.2:581.04
**On the transverse division of chromosomes as a result of colchicine treatment.**
C. R. (Doklady) Acad. Sci. U.R.S.S. 1940 : **2** : : 404–06.
The effect of colchicine on cell division was studied in the root tips of barley. It was observed that division of the centromere was not always longitudinal. Sometimes one chromatid arm was separated, sometimes the chromosome divided transversely into two across the centromere and sometimes it broke into four parts. This misdivision of the centromere may be a secondary effect of colchicine, resulting from the suppression of the spindle mechanism.

713. Hildesheim, M. 633.16:578.088
Het onderscheiden van gerstrassen aan het zaad.' (**Distinguishing varieties of barley by the grain**).
4th Jb. NaCoBrouw. Wageningen 1938 : 69–86.
In discussing the importance of being able to distinguish by the grain similar varieties of barleys especially when they occur together as admixtures in a sample, the author distinguishes characteristics that are genetically conditioned and unchangeable by environment and those which, though hereditary, are subject to variation through external influences. Moreover, since a group of characters of the first type in one variety may belong to the second type in another variety, it is essential to make a thorough study of each individual variety and the progeny of any aberrant forms observed. It is shown that both types of characters are of value in the examination of samples and the identification of any segregants or mutant forms that may have arisen.
As an indication of the lines along which such an examination should proceed, descriptions with illustrations are given for some of the most important of the fixed and variable characteristics of barley types.
A key showing diagnostic features of different varieties of barley grown in Holland should be of assistance in acquiring practice in the identification of the various types.

714. Krajevoj, S. J. 633.16:581.46:575.11
**Experimental production of awned varieties of barley from awnless varieties.**
C. R. (Doklady) Acad. Sci. U.R.S.S. 1940 : **29** : 419–21.
A mutant type with very small, deciduous awns, produced by irradiation of *Hordeum sativum* var. *medicum* Körn. 046, was crossed with the six-rowed, dwarf, dense-eared, awnless Japanese barley var. *Dundar-beyi* Zhuk. From this cross a completely awnless two-rowed type was

recovered. This was crossed with *Dundar-beyi* and in the $F_2$ a wide range of types was obtained combining in different ways the characters awned and awnless, rough- and smooth-awned, two-rowed, intermediate and six-rowed, dwarf (with thick culms, short internodes, few, broad, thick leaves, short grains, compact spikes) and tall. The $F_1$ had short, rough awns.

715. LAMMERS, R. P. 633.16–1.524(49.2)
**(Varieties of spring barleys).**
4th Jb. NaCoBrouw. Wageningen 1938 : 36–68.

An account of Holland's spring barley varieties grouped as fodder, hulled and malting barleys. The third group is discussed from several standpoints including the industrial requirements, disease resistance as well as grain yield and quality and reliability in these two latter respects. A table is given showing the racial characteristics of various home and foreign barleys grown in Holland and detailed recommendations showing the performance and purpose for which different varieties are suited conclude the paper.

## MILLETS AND SORGHUM 633.17*

716. GORST, G. F. 633.171:575:581.162.32
**(The method of millet breeding and seed production must be changed).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1940 : No. 3 : 37–38.

Evidence is advanced to show that cross-pollination may occur in millet much more often than is generally supposed under the conditions prevailing at various centres for plant breeding or seed production in the U.S.S.R. The panicle and seed characteristics of segregates from various hybrid types are mentioned and suitable measures for avoiding contamination of varieties or pure lines are prescribed for Russian workers.

717. POPOV, G. I. 633.171:575.42(47)
**(Constructive selection).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1940 : No. 5 : 9–11.

By a process of repeated selection in the direction of certain desired characters in millet marked improvements have been effected in the roundness of the grain, an increase of 14% in yield and of 17 days in earliness.

In the course of the work many deviations were observed, the deviations being different in the progenies of different initial lines; the author regards selection not merely as a sifting out of already existing types but as a positive creative process.

718. ARENKOVA, D. N. 633.171:576.356.5:581.04
**Polyploid races in millet (*Panicum miliaceum* L.).**
C. R. (Doklady) Acad. Sci. U.R.S.S. 1940 : **29** : 332–35.

Polyploidy was induced in millet by each of two treatments; in one the shoots of very young seedlings were immersed in 0·1% colchicine for 24–48 hours and in the other drops of 0·1% or 0·2% colchicine were applied to the leaf axils. Some of the panicles on treated plants had small and others large spikelets; the former gave seeds of normal size, the latter gave large seeds, from which tetraploid plants ($2n = 72$) were raised.

A tabular comparison of diploids and tetraploids of the variety White Chinese 2301 in respect of 21 characters is given. Fertility in the tetraploids varied from 25·1 to 73·5%, compared with 91–93% in the diploids, so that in spite of the much larger seed weight of the former, the total yield of grain per plant was less than in the diploids.

Tetraploids were also produced in the variety Red Saratov 742 and two naturally occurring tetraploid strains have been found.

719. 633.171:581.162.3:578.08
ASEEVA, L. M. 633.171:575.11
**(On the method and technique of hybridization of millet).**
Selektsija i Smenovodstvo (Breeding and Seed Growing) 1940 : No. 3 : p. 33.

Types of millet from the world collection of the Leningrad Institute of Plant Industry were used in a study of the technique of hybridization and the biology of flowering. Methods of

* See also Absts 607 and 755 (Millets).

emasculation and pollination are described, the two most successful being emasculation and pollination of fully grown buds and trimming of the buds accompanied by emasculation with subsequent pollination. Emasculation is best performed in the morning on the second or third day after the panicle begins to flower, the topmost and lowest buds of the panicle being removed. Bagging then follows.

Pollination must be done on the second or third day after emasculation either with pollen collected from mature buds or with a panicle in flower. The collection of the pollen and pollination is best done in the morning from 7·30–9·30 a.m., i.e. at the time when flowering is most intense.

Genetic analysis of the cross 1160 x 0215, showed that the $F_1$ was intermediate as regards length of the vegetation period and exhibited dominance of the diffuse panicle and the anthocyanin coloration of the spikelets and leaf sheaths. In $F_2$ there was segregation for various characters, e.g. panicle shape, seed colour, etc.

The conditions suitable for natural hybridization were also studied with reference to seed production.

720. Melchers, L. E. and
Lowe, A. E. 633.174–2.411.4–1.521.6
**The reaction of sorghum varieties and hybrids to milo disease.**
Plant Dis. Reporter 1940 : Suppl. 126 : 165–75. (Mimeographed).

An extensive list of varieties, hybrids and selections of sorghum is given, classified as susceptible, segregating or resistant to milo disease (*Pythium* root rot) according to their behaviour in tests in Kansas.

## RICE 633.18*

721. Ryker, T. C. 633.18–2.484–1.521.6:575.116.1
**Linkage in rice of two resistant factors to *Cercospora oryzae*.**
Phytopathology 1941 : **31** : 19–20. (Abst.)

The rice variety Blue Rose is susceptible to race 1 of *C. oryzae* but moderately resistant to race 2, while Blue Rose selection 2854–3 is resistant to race 1 but susceptible to race 2. When the two were crossed evidence was obtained from $F_2$ and $F_3$ progenies that resistance to each race was controlled by a single dominant factor, the two factors being closely linked in the repulsion phase. Only a few possible cross-overs have been obtained and they have not yet been tested.

## FORAGE GRASSES 633.2

722. Myers, W. M. and 633.2:576.354.4
Hill, H. D. 633.22:576.312.35
**Studies of chromosomal association and behaviour and occurrence of aneuploidy in autotetraploid grass species, orchard grass, tall oat grass, and crested wheat grass.**
Bot. Gaz. 1940 : **102** : 236–55.

The chromosome numbers of 116 plants of orchard grass (*Dactylis glomerata*) were counted. 59% of the plants had $2n = 28$, 22% $2n = 27$, 12% $2n = 29$ and 7% $2n = 30$. Five plants of crested wheatgrass (*Agropyron cristatum*) had 28 somatic chromosomes while one plant probably had 31. Meiosis was studied in orchard grass, crested wheatgrass and in tall oat grass (*Arrhenatherum elatius*, $2n = 28$). The average number of quadrivalents per nucleus was 3·9 in *Dactylis*, 3·7 in *Agropyron* and 3·8 in *Arrhenatherum*. Univalents were also observed in most plants at first metaphase. At anaphase, bridges and acentric fragments were seen. The frequency of occurrence of micronuclei in tetrads was also investigated.

723. Law, A. G. and
Anderson, K. L. 633.282:575.14
**The effect of selection and inbreeding on the growth of big bluestem (*Andropogon furcatus*, Muhl.).**
J. Amer. Soc. Agron. 1940 : **32** : 931–43.

*Inter alia* it is mentioned that the loss of vigour after one or two generations of selfing was very different in different lines.

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* See also Abst. 614.

724. Tysdal, H. M. 633.31:575.14

**Discussion on yield of self-fertilised lines of alfalfa.**

Rep. 8th Alfalfa Improvement Conf. July 8 and 9, 1940, Fort Collins, Colorado : p. 38. (Mimeographed).

In inbred lines of lucerne which had been selfed for different numbers of generations the decline in yield of forage and yield of seed agreed substantially with that calculated (the basis of the calculation is not given). Though the number of lines available in the advanced generations was limited, the decline in yield of forage seemed to have reached its limit by the seventh generation at a level of 26% of that of the original open-pollinated variety. The decline in seed yield was more drastic and continued after the seventh generation.

Progenies were raised from several inbred lines by crossing, selfing and open pollination and correlations were calculated between hybrids and inbreds, hybrids and open pollinated and inbreds and open pollinated in respect of yield of forage, yield of seed, leaf spot disease (*Pseudopeziza medicaginis*), black stem (*Aschochyta imperfecta*) and habit of growth. The forage yield of inbreds was not significantly correlated with that of hybrids or of open pollinated progenies, but that of hybrids was correlated with the yield of open pollinated progenies. Hence the yield of the progeny obtained by open pollination from an inbred line may be a useful index of the yield potentialities of that line in crosses, as is the case in maize. In respect of seed yield all the correlations were significant and positive. It follows that selection for seed yield in inbred lines will make possible the production of hybrids with high seed yield. The same applies to habit of growth, but the correlations for diseases were not always significant.

725. Atwood, S. S. 633.322:581.162.52:575.11

**Genetics of cross-incompatibility among self-incompatible plants of *Trifolium repens*.**

J. Amer. Soc. Agron. 1940 : **32** : 955–68.

All the plants used in this study gave so low a set on selfing that they were clearly to be considered self-incompatible. The $F_1$ generation of 13 plants consisted of 4 intra-sterile, inter-fertile groups, all being reciprocally compatible with both parents. Compatible crosses produced an average of 44·9 seeds per 10 flowers and incompatible crosses only 0·26. These results agree with the expectation on the theory of diploid personate multiple oppositional allelomorphs ($S_1$, $S_2$, $S_3$, $S_4$), the parents being considered as $S_1S_2$ and $S_3S_4$. By back-crossing $F_2$ plants to the parental and $F_1$ groups the theory was confirmed without exception and the genotypes of the different $F_1$ groups were established. Out of 37 plants from selfings or incompatible crosses, 19 were contaminants, 11 were homozygotes and 7 were heterozygotes. The compatibility of a cross could be determined within 20 to 72 hours by the withering of the petals and the reflexion of the pedicels.

The seed set per flower in compatible crosses appears to be a measure of the number of ovules produced, is inherited and is highly correlated with the seed set obtained by the use of bees under cages in the field (cf. "Plant Breeding Abstracts", Vol. X, Abst. 470).

726. Šmygun, V. N. 633.35:581.162.3

**(The method of crossing spring vetch).**

Selektsija i Semenovodstvo (Breeding and Seed Growing) 1940 : No. 5 : 22–24.

Observations were made on the most suitable stage at which to effect emasculation and pollination; this was found to be when the corolla has extended to within 1–2 mm. of the tips of the sepals in the young bud. If pollination is delayed beyond 24 hours after emasculation the receptivity of the stigma begins to diminish and the best time proved to be about 12 hours after emasculation which was carried out at 5–6 p.m.

727. 633.364:576.312.35

Young, J. O. 633.365:576.312.35

**Cytological investigations in *Desmodium* and *Lespedeza*.**

Bot. Gaz. 1940 : **101** : 839–50.

In *Desmodium* the haploid number 11 is reported for 15 species and the diploid number 22 for nine species. In *Lespedeza* $n = 11$ is reported for one species, $n = 10$ for seven species,

* See also Absts 607 and 755 (Clover); Abst. 608 (Vetches); Abst. 608 (Sweet lupin); Abst. 755 (Lucerne).

$n = 9$ for three species, $2n = 20$ for six species and one variety and $2n = 22$ for two species. In root tips counts of the three species in which only 9 bivalents could be seen at meiosis (*L. procumbens, L. violacea* and *L. frutescens*) 20 chromosomes were observed.

728. Rudorf, W. and Schröck, O. 633.366:575.24.061.1
Über das Auftreten stark abgeänderter Formen bei Steinklee (*Melilotus albus*). [**On the occurrence of widely variant forms in sweet clover (*M. albus*)**].
Züchter 1941 : **13** : 1–4.

In 1938 there were found in a large planting of sweet clover 281 plants with a bushy, lucerne-like habit, similar to the so-called dwarf forms of Canadian origin. Most of the plants died in the winter but widely varying amounts (8 to 9800) of selfed seed were obtained from 26 of them the following autumn. There were at least two types of bushy plants, one half-bushy and the other markedly bushy. The latter type included forms like Kirk's Alpha and others with larger leaves. The progenies raised clearly resembled their parent plants though some were not uniform. One of the parent plants had a low cumarin content and this character was recovered in some of its progeny.
The cause of the appearance of such large numbers of bushy plants is not easily settled. The seed from which they were raised had been harvested in bulk, was several years old and had been irradiated with X-rays. The irradiation did not seem to be the deciding factor as bushy plants occurred in the controls too. There remain the possibilities of crossing with Alpha or of mutation produced by aging.

729. Hackbarth, J. 633.367:575.116.1
Fragen der Vererbung, insbesondere der Koppelung bei *Lupinus luteus*. (**Problems of inheritance and in particular of linkage in *L. luteus***).
Züchter 1941 : **13** : 34–36.

Detailed evidence (most of which has been reviewed in "Plant Breeding Abstracts" from time to time) is cited in favour of the author's views on linkage in *L. luteus* as opposed to those of Sengbusch.

## ROOTS AND TUBERS 633.4*

730. Kreutz, H. and Schelhorn, M. v. 633.42:575"793"
Brassica-Formen als Grünfutterpflanzen. (***Brassica* forms as green fodder plants**).
Forschungsdienst 1940 : **9** : 440–52.

A winter type of turnip rape from Hungary has distinguished itself by rapid development, with ability to grow well when sown late and to flower early the following year. Efforts are being made to improve by selection its yield, while retaining its rapid development.
It has also been crossed with several other *Brassica* forms to obtain a variety of types of fodder plants for use in autumn, winter and spring possessing this valuable feature of earliness.

731. Morinaga, T. 633.426:581.162.5:575:576.356
(**The sterile mutants found in a certain strain of the rape**).
Jap. J. Genet. 1940 : **16** : 72–74.

Sterility occurring in a strain of rape, Norin No. 3 (a selection from Wase-Chosen), is recorded, the average number of seeds per pod amounting to 0·18 as compared with 27·1 in normal pods. The sterile forms showed many univalents at metaphase I and lagging chromosomes at anaphase. In many instances dyads were formed instead of tetrads and a high percentage of large $2n$ pollen was formed.
In addition a few partly sterile plants of another kind with slightly larger flowers were found; these were triploids and must have come from a combination of normal gametes with the $2n$ gametes derived from a sterile plant of the previous year's work.
Studying generations of the progeny of some similar sterile plants previously described (cf. "Plant Breeding Abstracts", Vol. IX, Abst. 301), the author records that the normals sometimes bred true and sometimes segregated into normal and highly sterile; the highly

* See also Abst. 607 (Swedes); Absts 612 and 614 (Potatoes).

steriles gave sometimes all normals and sometimes segregated as above; and the intermediate sterile types segregated into normals and highly steriles.
The high sterility in Norin No. 3 is attributed to chromosome anomalies and is believed to be hereditary. The original strain of Norin No. 3, it is suggested, may have been heterozygous for a recessive gene causing incomplete synapsis.

732. Stevenson, F. J. 633.491:575
**Genetics, cytogenetics and breeding in the potato: review of literature.**
Amer. Potato J. 1940 : **17** : 299–314.
A review of the literature on potato genetics and breeding mostly for the years 1938 and 1939. It is acknowledged that much of the material in the report, especially concerning that written in foreign languages, was taken from the abstracts published by the Imperial Bureau of Plant Breeding and Genetics, Cambridge, and the Review of Applied Mycology.

733. Macmillan, H. G. 633.491:576.16
**Note on the origin of the potato.**
Gartenbauwiss. 1939–40 : **14** : 308–25.
A review of the literature in which it is pointed out that the problem is still unsolved. In spite of the tendency to regard the cultivated potato as having originated from more than one wild species, the possibility of finding a wild plant of *Solanum tuberosum* is not excluded.
R. M. I.

734. Stelzner, G. and Torka, M. 633.491:581.143.26.035.1:631.557
Tageslänge, Temperatur und andere Umweltsfactoren in ihrem Einfluss auf die Knollenbildung der Kartoffel. (**Day length, temperature and other environmental factors as regards their influence upon tuber formation of potatoes**).
Züchter 1940 : **12** : 233–37.
The investigations were made on the following species over a two-year period:—*Solanum acaule*, *S. ajuscoense*, *S. Antipoviczii*, *S. chacoense*, *S. demissum*, *S. Henryi*, *S. Jamesii*, *S. maglia*, *S. polyadenium* and *S. verrucosum*. Most of the wild species set considerably more tubers under short-day conditions than under conditions of long day. The degree of the reaction varies greatly among the different species. Thus, the difference in yield under short and long day conditions is greater in *S. demissum* than in *S. Henryii*, which produces an almost equal weight of tubers under either set of conditions. Only one form, *S. Jamesii*, produced in both years the highest yield under normal length of day conditions. All the forms, with the exception of *S. Henryii*, flowered under long-day conditions, while short-day conditions had an inhibiting effect.
Investigations on the simultaneous effect of long and short day conditions and temperature on tuber formation, were made during the summer of 1938 on *S. Antipoviczii*, *S. chacoense* and *S. Kesselbrenneri*. Short-day and high temperatures (+23° C.) favoured tuber formation in all these species. There was, however, a general increase in yield, especially in *S. Antipoviczii* and *S. Kesselbrenneri*, when grown in temperature of +16° C. Tuber formation can therefore be influenced either by short-day conditions or by the corresponding temperature.
Great lack of uniformity was observed among seedlings of the various species with regard to the effect of length of day on flowering and tuber formation. R. M. I.

735. Bukasov, S. 633.491:582(82)
Una nueva especie de "*Solanum*" del subgénero "*Tuberarium*" de la República Argentina. (**A new species of *Solanum* of the sub-genus *Tuberarium* from the Argentine Republic**).
Rev. Argent. Agron. 1940 : **7** : p. 363.
The new species, *S.* (*Tuberarium*) *mechonguense* Buk., n.sp., identified at Leningrad, was received from Roberto Millán, who discovered it in the Argentine growing as a "wild potato" commonly found among *Colletia cruciata* in the Province of Buenos Aires.
Its chromosome number is $2n = 24$ and it resembles *S. Henryi* Buk. et Lechn., though differing from it in certain features of the flower and foliage.

736. Perlova, R. L. 633.491:582:575.1
**Seedling progeny of diploid species of potato.**
C. R. (Doklady) Acad. Sci. U.R.S.S. 1940 : **29** : 336–39.
Seeds were obtained from six diploid *Solanum* species when grown in the Pamirs. Small progenies were raised near Leningrad and the variation within them is briefly reported here. *S. Horovitzii*, *S. cañarense* and *S. catarthrum* showed only slight variation of secondary characters, while *S. Macmillanii*, *S. gibberulosum* and *S. aracc-papa* segregated in respect of primary specific characters.

737. Dykstra, T. P. 633.491–2.3–1.521.6
**Results of experiments in control of bacterial ring rot of potatoes in 1940.**
Amer. Potato J. 1941 : **18** : 27–54.
Varietal resistance to ring rot is discussed in a section of this paper. U.S.D.A. seedling No. 47102 appears to be very resistant. A number of seedlings were also tested for resistance.

738. Roivainen, H. 633.491–2.3–1.521.6
Perunarupi ja sen torjuminen. (**Potato scab and its prevention**).
Valt. Maatalousk. Tiedon. 1938 : No. 142 : Pp. 7.
The importance of producing scab resistant varieties of potatoes is stressed and the results of German and Finnish findings from variety trials at Tikkurila and elsewhere are summarized.

739. Roivainen, H. 633.491–2.411.4–1.521.6
Perunarutto ja sen torjuminen. (**Potato blight and its prevention**).
Valt. Maatalousk. Tiedon. 1939 : No. 155 : Pp. 9.
On the basis of trials at the Agricultural Research Station at Tikkurila information has been obtained on the blight resistance of Finnish and other varieties of potatoes.
*Ruusulehti*, Erdgold, Kungla and Parnassia were immune to blight and Tammiston aikainen, Puritaani, Pepo and *Paulin peruna* [= Paul Wagner] were among those with high resistance. The varieties in italics are also recorded as wart resistant.

740. Lehmann, H. 633.491–2.411.4–1.521.6:575.11
Untersuchungen über die Genetik und Physiologie der Resistenz der Kartoffel gegen *Phytophthora infestans* de Bary. Die genetische Analyse der Resistenz von *Solanum demissum* sp. (vorl. Mitteilung). [**Investigations on the genetics and physiology of the resistance of potatoes to *P. infestans* de Bary. The genetical analysis of the resistance of *S. demissum* sp.** (**Preliminary communication**).]
Züchter 1941 : **13** : 33–34.
Nine wild forms of *S. demissum* which were homozygous either for resistance or for susceptibility to races 8 or 5, or both, of *P. infestans* were inter-crossed in various combinations to provide material for the genetic analysis of resistance to the fungus.
About 23,000 seedlings were tested. In all crosses between susceptible and resistant varieties the whole $F_1$ was resistant and the segregation in the $F_2$ and the back-crosses showed that resistance in *S. demissum* sp. is conditioned by a single mendelian gene. The mode of inheritance was the same for both race 5 and race 8.
Reciprocal crosses showed no difference.

741. Lehtola, V. 633.491–2.412.5–1.521.6
Perunasyöpä. (**Potato wart**).
Valt. Maatalousk. Tiedon. 1938 : No. 148 : Pp. 7.
A list is given of some varieties resistant to wart (*Synchytrium endobioticum*) and of others that are susceptible. Among the latter are the Finnish varieties Tammiston aikainen and Vesijärvi.

742. Lunden, A. P. 633.491–2.412.5–1.521.6:575.11
Immunitet mot kreft (*Synchytrium endobioticum*) hos potet. (**Immunity to wart (*S. endobioticum*) in the potato**).
Nord. JordbrForskn. 1938 : No. 4–7 : 526–35.
The approach to the problem of wart resistance in potatoes and the technique for determining it is outlined with reference to relevant research in various countries—including the extensive experiments by Jørstad and Lunden in Oslo on technique and on the inheritance of immunity to wart disease.

Having indicated the difficulties of the genetic analysis of resistance in the potato in which tetraploidy and the presence of tetrasomics complicate the segregation phenomena, the author tabulates the results of the following types of combinations:—non-immune varieties, selfed, or crossed with non-immune; immune varieties, selfed; immune crossed by non-immune or the reciprocal; immune crossed by immune. The results can be most readily interpreted by postulating firstly a dominant factor X which conditions immunity even in the heterozygote (Xxxx); and secondly two complementary factors Y and Z which can produce immunity only when both are present. They too are effective in the heterozygote (Yyyy Zzzz) and they are independent of the action of the factor X.

None of the non-immune varieties gave immune progeny on selfing or on crossing with non-immune; but in view of the results of Salaman, Lesley, Black and Braun the author interprets the absence of such immune types in his experiments with due caution having regard to the small number of non-immune forms examined. The occurrence of immunes in the progeny of a non-immune variety may be attributed to the presence of a dominant factor inhibiting either one or more factors for immunity, but segregating independently.

Most of the immune varieties segregated in a 3:1 ratio for immune and non-immune plants, but the variety Arnica showed a 57:7 ratio and is probably Xxxx Yyyy Zzzz in constitution.

Other more complicated modes of segregation occurred in other crosses and these might, it is suggested, be produced by several different combinations of the immunity factors.

No correlation was found between immunity and morphological or other plant characteristics and it should therefore be possible in breeding to combine various desirable features.

Lists are given of the non-immune and immune varieties showing the factorial basis for their reaction to wart.

To ensure that at least a part of any breeding material shall be immune to wart, one parent in each seed plant family must be immune and if both parents are so, the chances of success are increased. Not all immune varieties, however, are equally potent in transmitting immunity, e.g. Kerr's Pink gives a much higher percentage of immune plants than Abundance, Hindenburg and Jubel. Doon Star also transmits immunity to a high percentage of its progeny. No variety has yet been found that is a homozygous dominant for resistance to wart and therefore gives only immune offspring.

743. Schwartz, M. 633.491–2.7–1.521.6:575.127.2
Bericht über die von Dr. Sellke im Jahre 1938 in Ahun (Creuse) durchgeführten Arbeiten. Prüfung der Resistenzeigenschaften von Kartoffelhybriden. **Report on the work carried out by Dr. Sellke in the year 1938 at Ahun (Creuse). Testing the resistant properties of potato hybrids**].
C. R. 4th Conf. Com. Int. Ét. Comm. Lutte Contre Doryphore, Wageningen 1939 : 49–52.

A collection of 700 $F_1$ and back-cross generation hybrids of *Solanum demissum* x *S. tuberosum* from Berlin-Dahlem and of 829 hybrids involving as "wild" [sic] parents, *S. acaule*, *S. chacoense*, *S. andigenum*, *S. demissum* or even several species in triple hybrids, from the Erwin Bauer Institute, Müncheberg, were tested for resistance to Colorado beetle. In addition 75 hybrid clones which had shown promise the preceding year were retested and 16 wild species and 16 approved German varieties were studied with a view to selecting wild and cultivated parents for crossing.

Laboratory tests of resistance to damage were carried out in which freshly emerged larvae were put on cut leaves under controlled humidity. Although there were great variations in the results of these tests and of the field damage, over a large range of material there was striking agreement between the two.

With regard (presumably) to the *demissum* x *tuberosum* hybrids, there is extreme variation in resistance within $F_1$ families whereas there were no marked differences between $F_1$ families. In the $F_2$ or in the later back-cross generations the resistance of *demissum* is much diminished or even lost. Resistance of the type found in *demissum* x *tuberosum* hybrids was not found in hybrids involving wild species other than *S. demissum*. In the cases where such hybrids survive a strong field attack or artificial infection, their success appears to be due to morphological features or to favourable regeneration and growth characteristics.

744. Trouvelot, B. 633.491–2.7–1.521.6:575.127.2
Les recherches faites en 1938 sur les plantes résistantes aux attaques du Doryphore. (**Researches carried out in 1938 on plants resistant to the attacks of the Colorado beetle**).
C. R. 4th Conf. Com. Int. Ét. Comm. Lutte Contre Doryphore, Wageningen 1939 : 46–49.

Planned crosses were started in 1938 at Ahun. Among the new plants worked with none as interesting as *Solanum demissum* were found but attention has been paid to hybrids of *S. chacoense.*
In the field, resistant hybrids are neither sought out nor left alone by the Colorado beetle. Among the hybrids as resistant as *S. demissum* was one giving about half the tuber yield of the *S. tuberosum* control. After feeding on *S. demissum* for several weeks the insects are unable to lay eggs even if transferred to *S. tuberosum.* Spectrographic examination of juice-impregnated papers shows a band of fluorescence peculiar to *S. demissum* and its hybrids. There is evidence that the resistance of *S. demissum* is due to a substance developed in connexion with chlorophyll activity.

## FIBRES 633.5*

745. Kreibohm de la Vega, G. A. 633.51:575:581.6
Distribución de semilla de algodón de variedades mejoradas. (**Distribution of cotton seed of improved varieties**).
Rev. Industr. Agric. Tucumán 1940 : **30** : 172–75.

Descriptions are given of the varieties Acala Blue Tag and the local chaco type and of the local selections Tucumán Cl and selected Lightning Express. Tucumán Cl is exceedingly vigorous, yields over 2 tons of raw cotton per hectare, and has silky fibre of excellent colour and drag, 30/32 mm. in length. Selected Lightning Express is early, yields 1½ tons of raw cotton per hectare, produces silky fibre with good drag, 30/32 mm. in length, with a ginning percentage of 32.

746. Hammond. D. 633.51:575–181.12:581.45
**The expression of genes for leaf shape in *Gossypium hirsutum* L. and *Gossypium arboreum* L. I. The expression of genes for leaf shape in *Gossypium hirsutum* L. II. The expression of genes for leaf shape in *Gossypium arboreum* L.**
Amer. J. Bot. 1941 : **28** : 124–38, 138–50.

A study was made of the development of leaf shape in cottons differing by single genes using mainly Huxley's formula, $y = bx^k$, for relative (heterogonic or allometric) growth, $x$ and $y$ usually being the length and breadth of leaves or leaf segments. The action of the genes was studied in the development of a single leaf and also in the development of the series of leaves that appear as the plant grows. In Part I the action of three leaf shape genes, normal (broad), okra (narrow) and superokra, in *G. hirsutum* was studied. The development of the leaves of the $F_1$ hybrid normal x okra, which is intermediate between the two parents, and of the broad, intermediate and narrow leaf $F_2$ segregates was also investigated. The narrow lobe of okra was found to be produced both by a narrower lobe in the early primordium and by an increased growth in length compared with breadth in the latter part of the development period. In Part II the actions of the allelic genes, laciniate, intermediate broad, recessive broad and mutant broad in *G. arboreum* were investigated. Differences in the development of single leaves between laciniate and broad types were similar to those between okra and normal types of *G. hirsutum.* It is also shown that shape differences between broad and narrow leaves are essentially due to differences in relative numbers of cells in the length and width planes.

747. Ware, J. O. 633.51:575.11:581.49:581.6
**Relation of fuzz pattern to lint in an upland cotton cross.**
J. Hered. 1940 : **31** : 489–96.

Ware, J. O.
**Genetic relations of sparse lint, naked seeds and some other characters in upland cotton.**
Bull. Ark. Agric. Exp. Sta. 1941 : No. 406 : Pp. 32.

The segregation of fuzz pattern and lint index (lint per 100 seeds) in a cross between the

* See also Abst. 608 (Flax); Abst. 608 (Hemp); Absts 612 and 614 (Cotton); Abst. 613 (Ramie); Abst. 614 (Kapok).

varieties Hastings Upright and No Lint is reported in the first paper. For the classification of fuzziness 20 grades are recognized, grade 20 being completely naked. Hastings Upright was grade 3 (grades 1–10 being called fuzzy, 10 having a fuzzy tip). No Lint was grade 19 (18–20 being the naked grades) and the $F_1$ was grade 15 (naked-adherent). In the grades from 13 to 20 (naked-adherent and naked) the seed is without fuzz but carries diminishing amounts of broken lint-fibres. In the $F_2$ a ratio of 1 fuzzy (grades 3–10) : 2 naked-adherent (grades 14–16) : 1 naked (grades 18 and 19) was obtained and these three groups had different lint indices, the fuzzy group having the highest, about 4 grm. and the naked the least, around 1 grm. The naked-adherent group gave the same segregation in $F_3$, the other two groups breeding true. Within the three main groups there were only minor differences in lint index and it appears possible to breed a cotton with a satisfactory lint index having any grade of fuzz from 1 to 10.

In the second paper the $F_2$ and back-cross segregations of the crosses Hastings Upright x No Lint, Sproull x No Lint and Okra Leaf x No Lint are analysed in respect of fuzziness, lint index, lint percentage and seed index (weight of 100 seeds). With respect to fuzziness, however, only the three main grades, fuzzy, naked-adherent and naked are considered.

The Sproull x No Lint cross, like the cross Hastings Upright x No Lint reported above showed that sparseness of lint was always associated with nakedness of seeds, the heterozygous naked-adherent class having an intermediate amount of lint. In both crosses the effects of modifying factors for lint index were also noted. Seed index was inherited in the usual multifactorial fashion and was not associated with fuzziness except that the weight of the fuzz slightly increased the seed index of fuzzy seeds.

The Okra Leaf x No Lint cross gave similar results but in this cross there was also segregation for leaf shape (1 : 2 : 1 in $F_2$ and 1 : 1 in back-crosses). This segregation was independent of the segregation for fuzziness, but there was a slight and not entirely consistent tendency for plants with larger leaf area to have higher lint index and seed index.

748. Panov, A. V. 633.51:575.127.2:581.165.71
**(Preliminary *rapprochement* of cotton species).**
Jarovizacija 1940 : No. 4 (31) : 106–10.

Grafts were made of *Gossypium hirsutum* (Upland) on *G. herbaceum*. Alterations were observed in both scion and stock, in vegetative characters, fruit characters and in the type of lint. Three flowers of the scion were pollinated with pollen of the stock and two normally developed bolls were obtained, both containing normally developed seeds. Three flowers of the reverse cross produced one boll. All the bolls contained a number of unfertilized ovules.

749. Yamada, N. 633.51:576.312:575.127:2
**[Cytogenetics of *Gossypium* (Parts I and II)].**
Bot. and Zool. 1937 : **5** : 1517–24, 1685–96.

This detailed review deals under the following heads with the work that has been done in various countries on the cytology and genetics of *Gossypium* : botanical classification, chromosome numbers of the species, gamete formation from the cytological aspect, hybrids between Asiatic and American forms (including the technique of hybridization and a detailed review of pollen tube behaviour), and the origin of the species found in various countries.

750. Mendes, A. J. T. 633.51:576.356.5:581.04:576.354.4
**Polyploid cottons obtained through use of colchicine. I. Cytological observations in octoploid *Gossypium hirsutum*.**
Bot. Gaz. 1940 : **102** : 287–94.

The treatment which furnished the highest percentage of chromosome duplication consisted in the immersion of delinted seeds in a 0·15% colchicine solution for about 16 hours. Meiosis was studied in "octoploid" plants ($2n = 104$) of *G. hirsutum* (a tetraploid species with a somatic chromosome number of 56). Quadrivalents are formed at first division but first anaphase is quite regular, 52 chromosomes going to each pole. Second anaphases are also regular.

751. Paiva, R. M. 633.51:581.6:578.08
Uma nova técnica para determinação de "fineza" das fibras de algodão, para uso do selecionador de plantas. **(A new technique for determining the fineness of cotton fibres for the use of plant breeders).**
Rev. Agric., S. Paulo 1940 : **15** : 486–91.

A mechanism is described whereby a small tuft of fibres is arranged between two cover slips

exactly 1 cm. in length, the manipulation of the fibres being made easy by placing them on a microscope slide edged with strips of velvet. The protruding portions at each end are cut off and the number of fibres then counted under the microscope, after which they are weighed. By taking 4 samples of 500 fibres each it is possible to weigh 2,000 fibres to within 0·0002 grm. after having kept them in a desiccator for 24 hours.
The fibres can later be fixed to the slide with albumen, treated with 18% NaOH and examined so as to determine the percentage maturity in the actual sample weighed.

752. Smith, E. C. 633.584.3:577.8
**Sex expression in willows.**
Bot. Gaz. 1940 : **101** : 851–61.
Some deviations from the dioecious condition in American *Salix* species are described and the theoretical problems raised by such deviations are discussed.

## SUGAR PLANTS 633.6*

753. 633.61:575(96.9)
633.61:576.312.35
633.61–2–1.521.6
**Report of Committee in charge of the Experiment Station, Hawaiian Sugar Planters' Association for the year ending September 30, 1940 :**
Pp. 130.
In the report of the cytological work it is mentioned that colchicine-treated seeds showed an increase in percentage germination and a stimulation of growth. The stimulation of growth was probably not due to chromosome duplication. Two "Giant Sponts" from New Guinea Mol. 5449 and Mol. 5557, from Purari River, were found to have a chromosome number of $n = 42$—this suggests that they belong to *S. robustum*. Two other *robustum* forms, Mol. 4485 and Mol. 4486, from the Markham River, both have the number $n = 30$. The chromosome number of a sorghum imported from New Guinea was $n = 10$.
In the report of the genetics section it is pointed out that the work was evenly divided between biparental crosses (in which both parents are known) and "melting-pot crosses" (female parent only known). The biparental crosses are subdivided into trial marriages (the testing of different parental combinations for the first time), repetition of successful crosses, nobilization work, selfing of new seedlings as they enter the breeding collection and intergeneric crosses. The melting-pot crosses are divided into the large melting-pot, the second melting-pot of selected individuals which are known to be good breeders, light tasselers and of high sucrose content and thirdly the field crosses, seedlings in Field Trial 2 at the regional stations.
In the pathology sections a list is given of Hawaiian varieties and their tolerance to the major cane diseases (eye spot, brown stripe, leaf scald, chlorotic streak, mosaic and *Pythium* root rot). There are also reports of work on other diseases.

754. Sartoris, G. B. 633.61:575.247
**Necrotic stripes in sugarcane.**
J. Hered. 1940 : **31** : 515–20.
In a striped variant of Uba the stripes have been found to be composed of dead cells. The development of the stripes is described in detail. The character is not invariably transmitted to the vegetative progeny and since the clone has not flowered its inheritance could not be studied. The death of the cells in the stripes is ascribed to somatic mutation.

755. 633.63:575(47)
633.1:575(47)
Miščenko, A. S. (Editor) 633.3:575(47)
**[Main conclusions from the scientific research work of the State Research Institute for the Sugar Industry (VNIS) for 1938].**
Vsesojuznyi N-I Institut Sakharnoi Promyšlennosti (Sci. Inst. Sug. Ind.)
Moscow-Leningrad 1940 : Pp. 300.
*Orlovskii, N. I.* (*Breeding work with sugar beet at the Stations of the Sugar Trust in* 1938). (*pp. 171–77*).
The author gives a general review of the progress made.

* Abst. 612 (Sugar cane); Absts 613 and 614 (Amorphophallus); Abst. 614 (Manihot).

*Korbut, N. P.* (*Results of the State Variety Tests with sugar in* 1938). (*pp. 177–81*).

The stations are classified according to the merit of the varieties they have produced, as regards sugar yield and freedom from bolting.

*Ševčenko, V. N.* (*Results of breeding for resistance to diseases with sugar beet and other crops of the beet rotation*). (*pp. 184–87*).

The entire collection of breeding material has been tested for reaction to silo rot; about 140,000 roots have been tested and 979 plants with the best combination of yield and resistance have been selected as mother plants. Another 16,000 of the most resistant roots have been selected as élites. The majority of the selections of previous years again proved resistant and the second generation selections were 25% higher in resistance than the Uladovka standard, which is regarded as a fairly resistant variety. Thirty forms combining resistance with high yield have been selected.

Resistance to *Botrytis* has been found to be an indication of resistance to the other organisms associated with silo rot, but is not in any way correlated with reaction to *Cercospora*. Certain lines highly resistant to *Cercospora* have been selected.

A number of wheat varieties resistant to brown rust (*Puccinia triticina*) and superior to Ukrainka in yield have been selected and some are at the same time resistant to bunt.

*Brojakovskii, N. V.* (*Results of work on the production of resistant varieties at the Ivanovo Station*). (*pp. 187–89*).

The clones most resistant to *Cercospora* have usually been found to give the most resistant offspring. Some 11,180 plants showing the lowest attack are being selected for yield and other characters. Sixteen individual plant selections and four hybrids have been selected for resistance to *Botrytis*. Resistance was found to be correlated with high noxious nitrogen and no exceptions have so far been found.

Four lines of winter wheat resistant to both brown rust and bunt have been selected.

*Ovčarenko, A. Ja.* (*Results of work of the Verkhnjačka Breeding Station on testing and producing varieties of sugar beet and cereals resistant to the main diseases*). (*pp. 189–90*).

The highest resistance to *Cercospora* was found in the lines obtained by inbreeding. Selection has also been carried out for resistance to silo rot and root rot. Wheat and oat selections for resistance to brown rust, smut and bunt have also been made.

*Kozyrenko, A. Kh.* (*Results of work of the L'gov Breeding Station on the production of resistant varieties*). (*pp. 190–92*).

Sugar beet selections made in previous years for resistance to root rot have retained their resistance. Selections have also been made for resistance to silo rot and to bolting.

Winter wheat selections resistant to brown rust and to bunt have been made.

*Šul'ga, M. S.* (*Results of breeding work at the Veselyi Podol Station for resistance to diseases*). (*p. 192*).

Resistance to Cercospora was found in 950 beet plants which were selected. Selections were also made of plants resistant to silo rot.

A number of wheat lines resistant to bunt and brown rust have been selected.

*Krasnoščekov, I. M.* (*Results of work of the Uladovka-Ljulintsy Breeding Station on the production of resistant varieties of sugar beet*). (*p. 193*).

The best selection has given 25·8% increase in root yield over the average for all varieties, a 38·8% increase in sugar content, a 10·3% increase in total sugar yield and 47% decrease in attack by *Cercospora*.

*Eletskaja, L. E.* (*Results of work of the Pervomaisk Breeding Station on the production of sugar beet varieties resistant to Cercospora and silo rot*). (*pp. 193–94*).

Lines resistant to *Cercospora* and others resistant to silo rot have been selected.

*Popov, G. S. and Rjakhovskii, N. A.* (*Results of work of the Ramon' Breeding Station on production of varieties resistant to diseases*). (pp. *194–95*).

Sugar beets resistant to silo rot, wheats resistant to brown rust and peas resistant to *Ascochyta* have been selected.

*Mazurenko, P. A.* (*Results of work on the production of resistant varieties of sugar beet at the Frunze Regional Station*). (*p. 195*).

A reduction in infection by silo rot and percentage of split roots has been observed as a result of selection.

*Sempolovskii, L. L.* (*Conclusions from the work of the beet section of the Uladovka-Ljulintsy Breeding Station for* 1938). (*pp. 195–200*).

Selection has been carried out for reduction of woodiness and fibrousness, for reduction of bolting, noxious nitrogen and invert sugar.

A large number of the selections have exceeded the standard in yield of both roots and sugar.

Vernalization increased the amount of bolting and has been used as a means of selecting low-bolting strains.

No advantage was obtained from mixing varieties of different types.

*Grin'ko, T. F. and Savčenko, R. F.* (*Brief results of breeding sugar beet at the Verkhnjačka Breeding Station in* 1938). (*pp. 200–04*).

In the preliminary tests 60% of the selections have exceeded the standard in yield of both roots and sugar, the maximum sugar content being 19·29%. This improvement has largely been brought about by growing the selected plants in the vicinity of particular varieties chosen as pollinators, followed by selection for combined high yield and sugar content.

*Gudvil, S. V.* (*The main results of beet breeding at the L'gov Station in* 1938). (*pp. 204–10*).

Lines selected for response to different manurial conditions and hybrids made with the same object were found to preserve their response, though only when grown under favourable conditions; under poor conditions they may show a greater response to some quite different manurial element.

An increase in both yield and sugar content was registered as a result of intravarietal crossing.

*Mazlumov, A. L.* (*Brief conclusions from the results of the work of the Ramon' Research Station on sugar beet breeding in* 1938). (*pp. 210–15*).

Increases of both sugar percentage and total sugar yield were obtained in 25% of the lines when compared with the standard No. 1030; the best was No. 66 which surpassed the standard by 20% in yield of roots, 1% in sugar content and 21% in sugar yield.

The variety 38–18 has given the highest yield of sugar per hectare of any variety in the Soviet Union, particularly in dry zones; it is very low in bolting, noxious nitrogen and attack of root rot.

Great success has attended the crossing of different sections of the same strain grown under widely different conditions of environment.

Mixtures of seeds of three or more good lines gave slightly better results than the average of the component lines.

*Šelekhov, N. N. and Sevost'janov, S. P.* (*Brief results of the work of variety production at the Pervomaisk Breeding Station in* 1938). (*pp. 215–18*).

The standard has been surpassed in sugar yield and in freedom from noxious nitrogen. Selection has led to an improvement in resistance to silo rot. Very high yields have been obtained from hybrids with *Beta maritima*; the hybrids are like ordinary sugar beet in shape of root but the tops are more luxuriant.

Selections are being made to reduce the amount of bolting.

*Egorov, V. A.* (*Brief conclusions from the work on sugar beet breeding at the Belaja Tserkov Breeding Station in* 1938). (*pp. 219–21*).

Some of the new lines exceeding the standard in both root and sugar yield have given an

increase of 25% in total yield of sugar. Some of the hybrids of sugar beet with other forms are promising, those with *B. maritima* being very resistant to *Cercospora* and also *Botrytis*. Varieties react differently to vernalization; increases of up to 17% in root yield and 11% in sugar content have been obtained; the use of vernalization, however, has made it necessary to start selection of non-bolting strains.

The selection of lines responding to specific manurial elements has been continued and a mixture of lines differing in response has given slightly better results than the lines sown separately.

Selection for single-seeded seed balls has continued.

*Dubinin, P. A.* (*Conclusions from the work of the beet section of the Biisk Breeding Station in* 1938). (*pp. 221–23*).

The standard has been surpassed in both yield and sugar content by 26·4% of the lines tested. The lines obtained by hybridization are particularly promising.

Progress has been made in selection for resistance to root rot, frost, drought, bolting, and other defects and for earlier maturity.

About 35,000 artificial crosses have been made, involving 22 different combinations of 16 varieties.

Varieties react very differently to vernalization, some giving improved yields, others lower yields.

*Sukačev, V. P. and Lobodin, K. I.* (*Brief conclusions on sugar beet breeding at the Veselyi Podol Station in* 1938). (*pp. 223–26*).

The breeding work has led to an increase of 14·8% in total sugar yield in the 5 year period from 1933. Better yields were obtained in 1938 from the hybrid material than from the products of selection. The method of repeated back-crossing is used; 46% of the lines have excelled the standard in both yield and sugar content.

*Čebolda, V. F.* (*Brief conclusions on the sugar beet breeding at the Frunze Breeding Station for* 1938). (*pp. 227–30*).

Between 30 and 50% of the lines are above the standard in both yield and sugar content. Both were increased in some varieties by vernalization.

*Fedorovič, L. J.* (*Brief results of work on sugar beet variety production at the Jaltuškovo Regional Station in* 1938). (*pp. 231–33*).

This year 19·3% of the selections exceeded the standard in root yield; 10% more were higher in total sugar yield than in 1937.

Selection for non-bolters was carried out after prolonged vernalization and intensive manuring. Some families selected for single-seeded seed balls contained as many as 80% of such plants. They have proved high in sugar content but low in yield.

*Savitskii, V. F.* (*Study of biotypes of sugar beet differing in energy of root growth and leaf development and their hybrids*). (*pp. 233–35*).

The highest yielding progenies were obtained from plants whose root development was not only most vigorous but began earliest in the season. This is not always associated with the greatest top development. The use of this character, or of final root weight without regard to developmental rhythm, may be misleading as a basis of selection.

*Zosimovič, V. P.* (*Hybrids of sugar beet with the wild B. vulgaris sp. maritima* L. *and with the local cultivated beet of Transcaucasia*). (*pp. 236–37*).

The sugar content of the $F_3$ hybrids of sugar beet x *B. vulgaris* sp. *maritima* L. varied from 95·7 to 102·1% of the standard. Some of them showed exceptionally high combinations of yield with high sugar content and low noxious nitrogen (75–76% of the standard). They are also unusually tolerant of brackish soil conditions.

Crosses have been made between sugar beet and the local cultivated beet of Transcaucasia, the roots of which weighed from 54 to 58% of that of the sugar beet and contained from 31·5 to 91·7% as much sugar. Marked heterosis was observed in the $F_1$ in respect of root weight, sugar content being intermediate; the roots were rounded, like the Transcaucasian beet in form. The leaf type was more or less intermediate but heterosis was also observed in respect of leaf weight. Some of the $F_2$ plants formed very large roots in arid conditions

and many of them had high sugar percentages. Many of the back-cross progenies with sugar beet had large roots and were promising.

*Bordonos, M. G.* (*Characteristics of the hybrids of beet with single-seeded seed balls*). (*pp. 238–40*).

The progeny of plants with single-seeded seed balls contained an unusually high proportion of plants that failed to flower and these plants in the following year bore single-seeded seed balls. $F_2$ generations of crosses between the two types segregated, the single-seeded plants being mostly late in maturity; certain early maturing single-seeded plants appeared occasionally, however, in 1938 and also certain late maturing normals. From them it would appear possible to produce single-seeded early maturing forms by breeding. The early forms produced seed which was just as high in germinating capacity as normal seed.

The $F_1$ hybrids between ordinary sugar beet and late maturing single-seeded forms flowered at the same time as normal plants and segregation for flowering date in $F_2$ showed early flowering to be a dominant character.

*Vasil'ev, L. V.* (*Study of bolting of $F_1$ hybrids between biotypes of beet differing in the length of their phases*). (*pp. 240–43*).

Crosses were made between various bolting strains and normal, non-bolting varieties. In 45% of the crosses the $F_1$ plants almost all bolted, in the remaining 55% the $F_1$ generation contained proportions of bolters varying from 0 to 80%. The highest proportions were given when varieties with short developmental phases were used as the non-bolting parents. Even the bolting lines are not homozygous and vary somewhat in the length of their phases, so that different individuals tend to give different percentages of bolters in their progeny.

Varying proportions of bolters occurred in the progenies of different combinations of varieties of different phasic characters.

*Okanenko, A. S.* (*Biochemical investigations of hybrids*). (*pp. 243–46*).

The chard when crossed with fodder varieties effected an increase in sugar content, especially with certain varieties such as Uladovka; the percentage of reducing sugars was also much diminished. Most of the hybrids of the chard, which contains the highest proportion of total, protein and soluble nitrogen, were intermediate in these respects. The same held for cellulose content. The salt content was in most crosses intermediate but in the $F_1$ of chard x sugar beet and chard x Oberndorf it was less than in either parent.

Invertase activity in hybrids of chard with green-headed fodder beet approached that of the latter parent at *p*H 4·7 but was as low as or lower than the chard at *p*H 7·0; from this it is concluded that invertase consists of two components. Peroxidase activity is highest in the chard and in the hybrids is reduced to the level of the forage types, this being accompanied by an increased weight of root. Catalase activity in such crosses was higher than in either parent.

The $F_2$ between Uladovka sugar beet and Eckendorf fodder beet contained some types like the sugar beet—high sugar, more in the vascular bundles than in the parenchyma in the inner zones only and low invert sugar content—and some like the fodder beet—low sugar, considerably more in the bundles than in the parenchyma, high invert sugar content. The sucrose content varied from 0 to 19% and the total sugars from 4 to 19%. There also occurred types differing from the parental, some being intermediate in sugar content but like sugar beet in the disposition, some intermediate in invert sugars but equal to sugar beet in sucrose, and others in which the sugar content of the parenchyma equalled or even exceeded that in the bundles. Some segregates contained less invert sugars than sugar beet.

In the sugar beet both the number of bundles and the number of rings is greater than in the forage varieties. Segregation occurs in the $F_2$ for both these features and also for the size of the cells of the parenchyma between the rings. Forms where these cells are large are always low in sugar, though where they are small the sugar content may be high or low.

Crosses have also been made of semi-sugar types x chard, and the hybrids crossed with sugar beet of various kinds. All the results lead to the conclusion that the various characters previously associated with sugar content, such as number of rings, number of vascular bundles, size of parenchyma cells, etc., are not in fact directly associated with it. In crosses of sugar beet with fodder beets there is a certain correlation with size of parenchyma cells and with

number of fibro-vascular elements but in crosses with chard there is no such correlation. Sugar content, proneness to inversion and loss of sugar during storage are independent characters and in breeding work it is therefore necessary to make further analyses of sucrose and invert sugar in the spring. High inversion is more frequently associated with the characteristics of the forage type, e.g. low sugar content.

*Kharetčko-Savitskaja, E. I.* (*Influence of the action of temperature on chromosome duplication in somatic cells of beet*). (*pp. 246–47*).

Germinating seedlings were subjected to temperatures of 35, 48, 50, 53 and 60° C. for one hour periods, followed by 4 hours at laboratory temperature, for varying numbers of times up to 9. Treatment at 35° had no effect till after the 8th dose, when a certain number of 36 chromosome cells were observed. After 1 dose at 48° there were 50% of the cells with two nuclei and after 3 doses all cells were multinuclear. Treatment at 50° was still more effective and binucleate cells appeared even in the dermatogen and the outer cells of the plerome; frequent nuclear fusions were observed; after 3, 4, 6 and 7 doses 36 chromosome plates were observed. The effect of 53° was more intense again, the number of dividing cells being, however, very much reduced.

Definite damage to the tissue was observed after 3 exposures to 48° and at 50 and 53° the damage was more evident in the form of darkening of the tissues and of the nucleus. After 2 to 3 exposures to 60° the roots usually died off. The most suitable treatments for producing tetraploids are thus thought to be 1–2 exposures at 48 or 50° C.

*Kharetčko-Savitskaja, E. I.* (*Application of the method of enforced self-fertilization of self-sterile forms*). (*pp. 247–48*).

Some of the lines of the first inbred generation were equal or even superior to the standard in vigour and yield. The average root weight of the $I_1$ = 230 grm., that of the standard = 223 grm.; 16% were equal to the standard in yield, 38% were below and 45% above. A greater reduction was observed in the second generation, the average root weight being 182 grm., only 81% of the standard. Even in the $I_2$ generation some lines surpassed the standard (35%), 10% were equal and the remaining 54% were below.

Inbred families from 2 strains contained no lines with a sugar content less than 10%. By the inbreeding method certain strains have been evolved which exceed the Uladovka standard by 2 and 3% in sugar content.

*Kovalevskaja, M. F.* (*The application of the method of wounding*). (*pp. 261–62*).

High yielding chimaeras were obtained by the method of wounding and observations on the $F_2$ generation obtained from seeds of these chimaeras showed that 6 out of 8 of them were higher in yield, by amounts varying from 103·8 to 111·2% of the standard. They were mostly lower, however, in sugar content.

*Maximčuk, L. P.* (*Breeding and seed production of cereals and leguminous crops at the Breeding Stations of the Sugar Trust*). (*pp. 263–68*).

An outline is given of the achievements of the various stations in producing improved varieties of winter wheat, winter rye, spring wheat, oats, millet, peas and lentils. Intravarietal crossing has been widely used for all crops.

*Gorlač, A. A.* (*Brief results of the work on breeding winter wheat at the Belaja Tserkov' Breeding Station in* 1938). (*pp. 268–70*).

Of the many new varieties produced by hybridization the most promising is Kievljanka 156, a new ecological type resembling Ukrainka and resistant to *Puccinia triticina*, frit and Hessian fly. It has outyielded Ukrainka by almost 100%. The work of improving the variety is being continued and selections of increased standing capacity have already been obtained. Selection work is also being continued with the variety Lesostepka 074, improvement having been effected in grain quality, rust resistance and firmness of enclosure of the grain.

Selection for resistance to *Tilletia* has been started.

*Kovtun, T. D.* (*Brief conclusions on winter wheat breeding at the Veselyi Podol Breeding Station in* 1938). (*pp. 270–72*).

A great many improved varieties have been produced. One, 398/163 Erythrospermum, combines resistance to rust and bunt with high baking quality and yield (35·5 c. per ha. as compared with 20 for Ukrainka). The variety 91/751 Lutescens has yielded 29 c. per ha. where Ukrainka gave 22·6, is highly resistant to *P. triticina* and hardier than Ukrainka. Variety 327 Ferrugineum has yielded up to 32·2% more than Ukrainka, which it has outyielded by 1·3 to 7% in nearly all areas, in some places producing up to 41·5 c. per ha.; it is resistant to rust, bunt and lodging, and is hardier than Ukrainka, though somewhat inferior in baking quality.

*Pokhil', I. F.* (*Socialist agriculture—better pedigree varieties of winter wheat*). (*pp. 272–74*).

The variety 09 Lutescens has outyielded Ukrainka by 14·2%, is hardier, resistant to lodging and rust, awnless, and equal in baking quality.

Varieties 015 Erythrospermum and 017 Lutescens, both from the cross M/389 x Ukrainka, have both surpassed the latter in yield, by amounts varying from 17·4 to 18·1%; their grain is large and uniform and of higher baking quality than Ukrainka. In some cases yields as high as 48 c. per ha. have been obtained from 015.

*Guss, R. Ju.* (*Varieties and methods*). (*pp. 274–75*).

The spring vetch L'gov 31–292 has been produced by individual plant selection; it has a remarkably wide range of adaptability, high yield both of grain and straw, uniformity of performance, is resistant to drought and early in maturity. Its promise was recognized at an early stage and seed was multiplied under intensive conditions while the early stages of selection were still in progress.

*Petojan, A. S.* (*Brief results of the breeding work with winter wheat at the Ivanovo Station in* 1937–38). (*pp. 275–78*).

Increases of 2 days in earliness of earing and of 2 c. per ha. in yield were noted in certain varieties after intraspecific hybridization.

Four hybrids from Zærja x Kharkov 120 are promising; they have exceeded Ukrainka by 6–15% in yield, and are very resistant to disease and to frost; they are awnless; the best is 208/34 Lutescens, which is resistant to *P. triticina* and *Tilletia* and superior to Ukrainka in baking quality.

Erythrospermum 2119/29 is superior to Ukrainka in every respect but baking quality.

*Bakhrušev, E. T.* (*Brief conclusions from the winter wheat breeding at the L'gov Station in* 1938). (*pp. 278–81*).

One of the best of the new varieties is 35/825, which has large grains and is very winter-hardy. Several combine resistance to *P. triticina* and *Tilletia* with yield well in excess of the standard 0917.

*Feitsarenko, A. I.* (*The method of group pollination in hybridization*). (*pp. 281–83*).

Group pollinations were carried out by putting 5 adjacent ears together in a bag after emasculation and introducing an ear of the pollen parent placed in a small vessel of water. The results were much better than artificial pollination.

*Gagarin, G. D.* (*Results of breeding lentils at the Belaja Tserkov' Breeding Station*). (*pp. 283–86*).

The variety 03 Narjadnaja is high in yield, bears yellow seeds with black spots, with yellow cotyledons; the 1,000 seed weight is 60–65 grm., the vegetation period 75–82 days.

The variety 09 Luna has green seeds and cotyledons; its leaves also remain green when the crop is fully ripe and thus enhance the feeding value of the straw. The 1,000 seed weight = 60–65 grm., the vegetation period 72–82 days and the yield moderate. Other newer green seeded selections are higher in yield.

A new variety 024 Krupnozerka has much larger seeds than 03 Narjadnaja and is equal to it in yield; it is earlier and characterized by excellent cooking quality and drought resistance.

All the above varieties are surpassed by some of the new hybrids.

Some of the varieties increase their yield with vernalization, some react but little and others give reduced yields.

*Kurbatova, A. T.* (*Results of breeding and seed production with herbage plants in* 1938). (*pp. 286–90*).

Promising varieties of red clover have been produced at a number of stations, and include one drought resistant form.

Various improved strains of lucerne have also been evolved.

*Boris, P. M.* (*Brief conclusions on lucerne breeding at the Belaja Tserkov' Breeding Station in* 1938). (*pp. 290–92*).

The variety 150 31 is much more resistant to brown spot than Grimm-Zaikevič and in yield is equal or superior to the standard.

*Mizin, A. A.* (*Brief conclusions on seed production of early red clover in* 1938 *at the Belaja Tserkov' Breeding Station*). (*pp. 292–94*).

The results of first and second cuts showed some of the new varieties to be promising.

756. Okanenko, A. V. and Savitzky, V. F. 633.63:575:581.6

(**Distribution of saccharose in roots of different sorts of sugar beet**).

Proc. Lenin Acad. Agric. Sci. U.S.S.R. 1940 : No. 12 : 3–5.

Experiments were made with Russian and foreign varieties to determine (1) in which varieties the parenchyma contained the maximum amount of sugars and (2) which tissues in the fibro-vascular region have the maximum of sugars. The data obtained could be used in hybridization work to obtain a higher sugar content. The *ZZ* variety could for example be improved by breeding for a type that is characterized by a greater capacity for accumulating sugar in the parenchyma and the Janasche variety by crossing with the *ZZ* type for increased sugar content.

The amount of sugar present could also be raised by crossing two varieties differing in this character, but one parent should have a high content in the rings of the fibro-vascular bundles (with a low percentage in the parenchyma) and the other should have its total sugar evenly distributed throughout the root.

Another method of correcting the tendency to unequal distribution of sugar in the parenchyma is demonstrated by analyses of roots from crosses between the sugar beet and the Swiss chard and Swiss chard hybrids.

757. 633.63:581.14:576.356.5

Schlösser, L. A. 635.64:581.14:576.356.5

Physiologische Untersuchungen an polyploiden Pflanzen-Reihen. (**Physiological investigations on polyploid plant series**).

Forschungsdienst 1940 : **10** : 28–40.

The material used consisted of $2n$ and $4n$ races of *Lycopersicon racemigerum* and *L. cerasiforme* and $2n$, $3n$ and $4n$ races of Kleinwanzleben E sugar beet, grown in pots under uniform greenhouse conditions.

With the *L. racemigerum* material the roots and shoots were harvested on four days, at intervals of two days and their fresh weight, dry weight and nitrogen content determined. Harvesting was begun when the diploids had unfolded the seventh leaf and the most advanced flower bud was about 4 or 5 days before anthesis. At this time the tetraploids were unfolding the fifth leaf and the flower buds were much behind those of the diploids in stage of development. At the first harvesting, the dry weight and fresh weight of the shoots was higher in the diploids but by the last harvest the tetraploids had overtaken the diploids. No consistent differences in respect of root weight were detected nor was there any straightforward relationship evident in respect of nitrogen content in shoot and root.

The results with *L. cerasiforme*, though limited to two harvestings, showed similar trends.

In the sugar beet experiment only the leaves were harvested, at a time when the diploids had 7, the triploids 6 and the tetraploids 5 leaves unfolded. The fresh and dry weights for the successive leaves are given. In total dry weight the diploids were highest and the tetraploids least but if only the first 5 leaves were considered the tetraploids were highest in both fresh and dry weight and the diploids least, i.e. the tetraploids produced fewer but larger leaves. In average nitrogen content the diploids were highest and the tetraploids least.

Summing up, the author points out that morphologically autopolyploids are commonly distinguished by broader and thicker leaves or leaflets, physiologically by a slower development

with ultimately a greater total production of fresh and dry matter. In considering the parallel development of plants of an autopolyploid series there is a "turning point" at which the polyploids overtake the diploids. From the breeder's point of view autopolyploidy is most likely to be of practical use in the case of fodder plants and grasses and a profitable line of work would be to try to push forward the "turning point". The inconsistency of the results with respect to nitrogen content shows the need for further physiological research.

758. Reinboth, G. 633.63–2.484–1.521.6(45)
Die Cercosporabekämpfung bei den Rüben. (**The control of *Cercospora* in beets**).
Zuckerrübenbau 1941 : **23** : 10–12.

Discussing conditions in Italy, the writer states that though varieties of sugar beet resistant to *Cercospora* are available there, they are all late maturing types, and therefore regarded as undesirable owing to the risk of reduced sugar yield as a consequence of autumn sprouting. Slight infection with *Cercospora* is said to promote sugar formation in the beet.

759. Coons, G. H. and Stewart, D. 633.63–2.484–1.521.6:575.125
**U.S. 200 x 215, a new sugar beet variety resistant to leaf spot.**
Sug. J., U.S. Dep. Agric. Washington D.C. 1940 : July : Pp. 4.

Strains which have a fairly high resistance to *Cercospora* leaf-spot have been obtained by mass selection of commercial varieties. It was practically impossible to base selection on the degree to which leaves were affected and use had to be made of the criteria of weight development and high sucrose percentage under severe leaf-spot exposure. The advances made by mass selection, however, were not adequate and the problem was therefore attacked by the use of selection and continued inbreeding to obtain inbred strains of sugar beet of high leaf-spot resistance from which disease resistant and high yielding hybrids or synthetic varieties could be produced. Two inbreds, U.S. 200 and U.S. 215, which have marked leaf-spot resistance, have been obtained. The two strains are not completely homozygous. U.S. 200 has a high sucrose percentage and approximates in yield to the commercial "sugar-type" varieties. U.S. 215 has a moderately high sucrose percentage and in yield of roots per acre is about equal to the best "yield-type" European varieties. Commercial production of the seed of U.S. 200 x 215 is accomplished by mixing one part of stock seed of U.S. 200 with three parts of stock seed of U.S. 215 for planting the seed field. This procedure has to be carried out each year and élite stocks of U.S. 200 and 215 are maintained by the U.S. Department of Agriculture. The variety contains a certain percentage of selfs as well as hybrids. It is not leaf-spot proof but loss of leaves takes place after ordinary varieties have long since been practically defoliated. Even in years when leaf-spot is not serious the variety U.S. 200 x 215 will yield as well as European strains. Tests in 1938 and 1939 are given and in both years the new variety outyielded the control.

760. Perak, J. T. 633.682:576.312.35
Los cromosomas de Manihot Tweedieana. (**The chromosomes of *Manihot Tweedieana***).
Rev. Argent. Agron. 1940 : **7** : 364–65.

A note dealing with the chromosome numbers found for various species of *Manihot* by Graner and Boiteau (cf. "Plant Breeding Abstracts", Vol. VII, Abst. 714, and Vol. IX, Abst. 374) and by the author who records 36 chromosomes and 18 pairs at metaphase in *M. Tweedieana*. The chromosomes of this species are as small as those of *M. utilissima*. He also gives 36 as the chromosome number for a variety of *M. utilissima* as determined from root tips.

## STIMULANTS 633.7*

761. Sankewitsch, E. Ch. 633.71:537.531:575.257
(**Influence of X-rays upon the formation of leaves in *Nicotiana rustica***).
Bull. Acad. Sci. U.R.S.S. Sér. Biol. 1940 : No. 4 : 621–27.

In this paper dealing with aberrant forms of leaf and stem following X-ray irradiation of seed of *N. rustica* there is a brief reference to a possible way of obtaining Burdo grafts (cf. "Plant Breeding Abstracts", Vol. VIII, Abst. 1110).

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* See also Abst. 608 (Poppy); Absts 608 and 614 (Tobacco); Abst. 614 (Coffee).

762. Kuzmenko, A. A. and Tikhvinskaya, V. D. 633.71:575.127.2:581.192
**(Inheritance of nicotine and anabasine content by *Nicotiana tabacum* x *N. glauca* hybrids and interaction of stock and scion when these species are grafted).**
Bull. Acad. Sci. U.R.S.S. Sér. Biol. 1940 : No. 4 : 564–76.

The relevant literature and the previous findings by other workers on the effects of interspecific hybridization on the accumulation of alkaloids and other chemical constituents in the tobacco plant are reviewed. The method used in the present investigations was the same as that used in similar experiments in 1938.

In 1939 experiments on a larger scale were conducted, grafts involving various combinations of *Nicotiana* species as well as interspecific hybrids of *N. Tabacum* and *N. glauca* being used.

The length of the vegetation period of the $F_1$ plants from *N. Tabacum* x *N. glauca* was 86 days as compared with 82 and 125 days for the pistillate and staminate parents respectively. The hybrids also had inherited the anabasine from the *N. glauca* parent, while in the content of protein nitrogen and other chemical constituents in the leaves they resembled *N. Tabacum*. Anabasine, which is lacking in *N. Tabacum*, predominates in the $F_1$.

In the grafting experiments marked interaction between scion and stock was noted in the various combinations made. The leaves of *N. glauca* grafted on *N. rustica* contained a large amount of nicotine and the nearer the leaves were to the site of union the higher was their nicotine content. The influence of *N. glauca* as a scion on *N. rustica*, though much less marked, was apparent in the considerable amount of anabasine present in the leaves of the latter species. This difference in the mutual influence between scion and stock held in most cases. *N. Tabacum* grafted on *N. glauca* invariably contained a small amount of nicotine, whereas its leaves contained anabasine, and even when used as a stock for *N. glauca* it contained a very small quantity of anabasine.

The influence of *N. Tabacum* as a stock upon *N. glauca* was greater than that of *N. rustica*.

Possible physiological processes affecting the production of the several alkaloids in the component parts of such *Nicotiana* grafts are briefly considered.

763. Oka, T. 633.71:575.127.2:581.6
**(Interspecific hybridization in *Nicotiana*. Breeding of nicotine-free tobacco by hybridization—*N. Tabacum* x *N. glauca*).**
Jap. J. Genet. 1940 : **16** : 87–88.

*N. glauca* contains anabasine but no nicotine. The $F_1$ from *N. glauca* x *N. Tabacum* is also nicotine free, the presence of anabasine being genetically dominant to nicotine. Though the $F_1$ has been recorded as sterile, the author succeeded accidentally in obtaining 150 seeds in two pods after back-crossing large numbers of the $F_1$ to *N. Tabacum* represented by the Turkish variety Samsun, which has a nicotine content of 1·764%.

The chromosome numbers of the $F_1$ plants ranged from 49 to 59—invariably more than the 48 of *N. Tabacum*. The nicotine content varied between 0·1140 and 1·2610%.

The author thinks it should be possible to produce nicotine free varieties by selecting for the lowest nicotine content.

The leaves, stems and roots of *N. glauca* contain 0·76–1·00% anabasine but its effect on the taste is very slight.

764. Goodspeed, T. H. and Avery, P. 633.71:576.356.4
**The twelfth primary trisomic type in *Nicotiana sylvestris*.**
Proc. Nat. Acad. Sci. Wash. 1941 : **27** : 13–14.

A new, twelfth primary trisomic called Stiff has been obtained. Stiff may be recognized by the extreme stiffness of its leaves, by necrotic areas on the leaves and by the length of its flowers. The extra chromosome is transmitted through the eggs to 38% of the progeny.

765. Kunkel, L. O. 633.71–2.8:575.242
**Genetics of virsuses pathogenic to plants.**
Publ. Amer. Ass. Advanc. Sci. 1940 : No. 12 : 22–37.

It has been shown by experiment that if the virus of the tobacco mosaic is transferred to healthy plants of *Nicotiana glutinosa* L. and sub-inoculations are made, about one plant in 200 will show signs of a disease distinct from tobacco mosaic. From continued inoculations

1–2 per cent. of variants may be produced. These mutants have given rise to sub-mutants and these in turn to other mutants. The diseases caused by these mutants may be very mild, others lethal; some show high infectivity, others are transmitted with difficulty.
Strains related to the tobacco mosaic virus have infected cucumber but these cucumber-mosaic viruses will not infect tobacco.
Experiments are described which were made to determine the frequency of the occurrence of yellow mutants in mosaic-disease leaves of Turkish tobacco and also whether or not yellow mutants would arise with equal frequency in plants affected by different strains and if there was any seasonal variation. R. M. I.

766. Valleau, W. D. and
Diachun, S. 633.71–2.8–1.521.6
**Burley tobacco diseases in central Kentucky in 1940.**
Plant Dis. Reporter 1941 : **25** : 18–20. (Mimeographed).
This report contains a brief account of tests with farmers of two types of mosaic-resistant tobacco. Five of the resistant strains tested derived their resistance from the *Tabacum* var. Ambalema and three derived it from *Nicotiania glutinosa*, by five back-crosses on the variety Burley 16.
In the strains carrying the *glutinosa* gene for resistance certain undesirable characters appeared, abnormally light colour in two strains, blooming at half the size of Burley 16 in two strains, large numbers of suckers blooming at the time of primary bloom in all three strains and extremely tough suckers. These defects may possibly be overcome by further back-crossing.
The Ambalema hybrids were highly resistant to mosaic and black root rot and produced good quality tobacco but the type of plant is not good enough to permit of recommending any of them for general distribution, though some growers were very enthusiastic about them. They were highly susceptible to scald caused by excessive wilting during hot days.

## OIL PLANTS 633.85*

767. Grinčak, A. L. 633.85:575(47)
**(Urgent problems in breeding and seed production in regard to oil bearing crops).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1940 : No. **3** : 31–32.
The need for extending variety trials and plant improvement work to a much wider range of oil crops in the U.S.S.R. is urged. Improved methods of producing élite seed of such crops should be adopted and a chain of regional seed farms should be established to provide high grade seed for the various esperimental plant breeding centres for the further development of work on the oil bearing plants.
A programme is suggested for the following crops among others: sunflower, castor, linseed, groundnut, mustard, soya bean, poppy, *Perilla* and *Lallemantia*.

768. Lowig, E. and 633.853.49:581.192(43)
Baumgartner, O. 633.853.49:581.48:575.061.6
Untersuchungen über den Ölgehalt von Rapssamenherkünften. **(Investigations on the oil content of samples of rape seed of different origin).**
Forschungsdienst 1940 : **9** : 496–502.
Cultivation experiments have shown incidentally that seed samples from different localities though representing the same variety may exhibit appreciable differences in the oil content. Research has therefore been begun on the influence of environmental factors on the oil production of Germany's main oil crops. The present paper on "Dr. Lembke's" and "Janetzki's" winter rape records varietal differences and also differences between samples from different localities, in regard to various morphological, chemical and other characteristics of the seed. The tendency to form reddish seeds appears to be a varietal characteristic: seed colour was not correlated with oil content.

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* See also Absts 607 and 608 (Sunflower and Safflower); Absts 613 and 614 (*Aleurites montana*); Abst. 613 (*Perilla ocymoides*); Abst. 614 (Sereh).

769. VAKULIN, D. J. D. 633.854–1.524(47)
**(On the possibility of determination of varieties of Lallemanzia according to absolute weight and size of seeds).**
Proc. Lenin Acad. Agric. Sci. U.S.S.R. 1940 : No. 10 : 16–18.

*Lallemantia iberica* F. et M. is a new oil bearing plant containing in its seeds up to 37% of rapidly drying oil with an iodine number as high as 200·0. The oil, which is used mainly for the preparation of drying oils, paints and varnishes but can also be used in food stuffs, resembles the oil of *Perilla ocymoides* in type.

The plant itself is characterized by earliness, drought resistance, absence of shedding of the seed even in dry seasons, and is not prone to disease. *Lallemantia iberica* has, however, been little studied and is not very widely found.

The results here recorded are based on 3 years' observations and show that the white flowered and the blue flowered forms exhibit differences in habit, plant height, reaction to vernalization, and in seed weight and size. The seed of the white flowered *Lallemantia* is twice as heavy and as large as that of the blue form. This seed characteristic may be affected by certain geographical and other external factors; but heritable differences between the two forms of the plant are clearly to be seen.

770. RAMELLA, R. 633.854.54:575(82)
El lino P.330 M.A. Su origen, historia y valor agrícola. **(Linseed P.330 M.A. Its origin, history and agricultural value).**
"Granos" Semilla Selecta, B. Aires 1939 : **3** : No. 8 : 3–15.

The variety is a selection of the linseed Malabrigo. The work of selection, which was begun in 1925, is described. The factors to which chief attention were given were good commercial type, yield and wilt resistance. One year all but 4 out of 150 progenies were destroyed by wilt and the best of these survivors was the line named 330, which in three successive years has given yields in excess of any other variety. It is tall and vigorous, with mauve flowers, large abundant fruits and seeds, giving a relative yield of straw: grain of 4 : 1. Its vegetation period is about 130–140 days. It has maintained its absolute resistance to wilt. It yields 10–12 quintals per hectare and in bad wilt years gives 30–40% more than other varieties. It is somewhat lower than Klein 11 in oil content, the iodine number being from 179 to 186. The thousand grain weight is 7·2 grm. and the hectolitre weight 64·4 kg. Its cultivation is rapidly extending.

771. BARANSKII, D. I. 633.854.78:575.42:581.6;578.08
**(A new method of selecting the sunflower for oil content).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1940 : No. 3 : 44–45.

Selection of sunflower seeds for high oil content can be effected by choosing seeds with relatively little husk. This can be simply done by immersing a sample of the seed in some liquid that is lighter than water (e.g. benzene) and eliminating the seeds that float. The rest that sink have a lower weight of husk as compared with kernel and represent the portion with the greater oil content. These seeds should be thoroughly dried without delay and are then ready for sowing. An apparatus for selecting sunflower seed on this basis is described as well as its utilization in prolonged mass selection to obtain improved strains with higher oil content for growing on a commercial scale.

772. JOFFE, E. J. 633.854.78:576.312.342
**Polymorphism of karyotype in *Helianthus annuus* L.**
C. R. (Doklady) Acad. Sci. U.R.S.S. 1941 : **30** : 76–78.

From his own and other work the author has tabulated in semi-diagrammatic form the somatic chromosome complement of three cultivated and two wild forms of sunflower and shown that no two of them have the same complement, though not all the chromosomes are different in every form.

773. KIRJUKHIN, I. 633.854.78:581.162.32:578.08
**(The influence of wounding the pistils of sunflowers on pollination).**
Jarovizacija 1940 : No. 3 (30) : 213–15.

Pollination with a mixture of pollen from a number of varieties applied without touching the stigma of the emasculated flowers failed to effect fertilization, whereas flowers so pollinated after the pistil had been rubbed with a brush or the finger set normal seed. Such rubbing followed by self-pollination failed to bring about seed development.

774. Ljaščenko, I. F. 633.854.78–2.5–1.521.6:575.3
(**Influence of external conditions on dominance in sunflower**).
Jarovizacija 1940 : No. 4 (31) : 111–12.
In crosses of sunflower varieties resistant to *Orobanche* with susceptible varieties, the $F_1$ plants of all 123 combinations examined in 1938 were tolerant, whilst in 1939 out of 20 of the same crosses examined the $F_1$ plants of 18 were susceptible, one was tolerant and one resistant.

## MEDICINAL PLANTS 633.88*

775. Pretel, A. R. 633.885.1:575(85)
El problema de las cinchonas en el Peru. (**The *Cinchona* problem in Peru**).
Bol. Direcc. Agric. Ganad. Colon. Lima 1937 : **8** : Nos. 26–27 : 11–38; 1938 : Nos 28–31 : 3–15.
A full historical survey is given of the discovery of the use of *Cinchona*, including certain corrections of the commonly accepted story of the Countess of Chinchón, whose life was saved by the "powders"; the spread of their fame to Spain, Italy and later the entire world, the various expeditions that have been later sent in quest of *Cinchona* and the discovery of the active principles are also dealt with in detail. Its present cultivation in various countries is discussed, followed by sections on classification and full descriptions of the species, varieties and hybrids, with illustrations and indications of their origin and distribution; certain allied genera are also included.
The floral biology of *Cinchona* is described.
In discussing selection, it is recommended that plants should be healthy and vigorous, with erect trunk and branches, reddish leaves of medium size, thick bark, high quinine content and should be not too early in flowering and resistant to *Corticium javanicum* and insects. Mutation is said to be rare and not a promising means of improvement.
Hybridization is described and it is recommended that promising hybrids be multiplied by grafting them on to *C. succirubra*.
The remainder of the work is devoted to methods of exploitation.

## RUBBER PLANTS 633.91†

776. 633.912:581.165.1:581.143.7(72.9)
Aanbevolen Hevea-plantmateriaal 1940–41. (**Recommended *Hevea* planting material 1940/41**).
Bergcultures 1940 : **14** : 1578–84.
This article contains the latest information on the performance of various rubber clones in Java, Sumatra and Malaya with descriptions of those specially recommended for planting on a large or small scale (cf. "Plant Breeding Abstracts", Vol. X, Abst. 523). Particulars are also given of numerous seedling families including some of hybrid origin and some derived from illegitimate or self-pollinations.

777. Dijkman, M. J. and
Vollema, J. S. 633.912–1.557:581.02
Resultaten van een hoog gelegen heveacloonentoetstuin. (**Results from a high lying plantation for testing rubber clones**).
Arch. Rubbercult. Ned.-Ind. 1940 : **24** : 557–70.
The good or bad effects of elevation upon rate of growth, yield, resistance to wind damage and to disease are reported from observations on a plantation laid out at 515 m. above sea level on the Pondok Gedeh Estate. It should be noted that the effects of elevation do not, however, mask varietal differences in performance which still persist in the different environment.

778. Klippert, W. E. 633.912–2.421.9–1.521.6:575(8)
**The cultivation of *Hevea* rubber in tropical America.**
Chronica Botanica 1941 : **6** : 199–200.
In attempts to establish *Hevea* plantations in South and Central America, the only serious problem encountered has been the South American Leaf Disease (*Dothidella Ulei*). Because

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* See also Abst. 613 (Peppermint).
† See also Abst. 614.

of the serious effects of this fungus, resistant clones are necessary. Resistant individuals are fairly easy to find in any seedling nursery, but the combination of resistance with high yield is less easy. The high yielding clones from the far East are nearly all susceptible, but are of use for crossing with highly resistant material. Suitable resistant clones will shortly be ready for commercial planting on a limited scale.

779. Koroleva, V. A. 633.913:575.42
**(On the role of selection in kok-saghyz).**
Proc. Lenin. Acad. Agric. Sci. U.S.S.R. 1940 : No. 13 : 3–6.

The merits of various criteria for use in choosing suitable types of kok-saghyz for improvement by breeding are enumerated with extracts from selection experiments on this plant.
Mass selection of seed from late flowering plants with wide, thick leaf blades, thick flower stalks and large buds should tend to improve a population by increasing the size of the root and its percentage of rubber and also the size of the seed.

## FRUIT TREES 634

780. Lukašev, A. M. 634:575(47)
**(On the path of Michurin).**
Jarovizacija 1940 : No. 3 (30) : Pp. 179–83.

The pear hybrid Tema bears fruits weighing up to 400 grm., slightly acid-sweet in flavour, with melting flash, almost free from stone cells, and containing 10·64% sugar, 0·915% acid and 1037% pectins.
The variety Polja is similar in qualities though the fruit is somewhat smaller and sweeter having a sugar content of 10·9%, acid 0·72 and pectins 1·9%.
The hybrid Olga is still smaller, with a sugar content of 10·4%, acid 1·34 and pectins 2·27%. It acquires an excellent flavour when in an over-ripe condition.
The hybrid Lida has fruits weighing 200 grm. All these varieties ripen between 5th and 15th September and are suitable both for dessert and preserving.
The following contributions are also included:—

*Lisavenko, M. A., pp. 180–81.*

The raspberry Vislukha was selected in 1935 from a mixture of raspberries and is now being extensively propagated; it is very frost-resistant and gives high yields of large berries of good flavour.
The strawberry Aborigen Altaiskii [Altai Aboriginal] is small but of good flavour and suitable for preserving.
The gooseberry Michurinets is resistant to *Sphaerotheca*.

*Pilim, G. M., pp. 181–83.*

Hybrids of myrobalan, currant, raspberry, *Sphaerotheca* resistant gooseberries and tomato are mentioned.

781. Kemmer, E. 634:575:581.02
Die Bedeutung der Standortsfragen für die Obstzüchtung. **(The significance of locality problems for fruit breeding.)**
Forschungsdienst 1940 : **9** : 511–17.

This is a discussion of the effects of external factors on the expression of characters, with special reference to cases in which the result is radically different from what would have been expected if only the inherited factors were considered. The stock is counted as an external factor.
Numerous examples are given of modifications of drought, frost- and disease-resistance by known or unknown external factors and they are used to underline the importance of the breeder having as complete as possible a knowledge of the potentialities of his material.

782. 634:575.127(47)
634.11:575(47)
Gorškov, I. S. 634.23:575(47)
**(From the work of the Central Breeding and Genetics Laboratory of I. V. Michurin).**
Jarovizacija 1940 : No. 3 (30) : 152–56.

Descriptions are given of some of the promising new seedlings. Apple Seedling No. 711, from

Borovinka x Simirenko's Reinette, has large fruits of fairly good quality, ripening in late September and keeping till January; the tree is hardy and not attacked by scab.
Seedling No. 4 is a seedling of Bellefleure Crab by open pollination. The fruits are large, of high quality, ripening in the second half of September and keeping till March; the tree is healthy and hardy.
Seedling No. 1651 has fruits of medium size, with sweet juicy flesh of good quality, ripening in summer; it is free from pests and diseases.
The sour cherry Seedling No. 6 (from Northern Belle by open pollination) bears large fruits weighing 3–5 grm., with free stones, thin skin, juicy flesh of good flavour and unusually high sugar content (13·8%) and low acid (1·27%); ripening is in the third week of July. The tree is hardy, free from disease and from gumming.
Hybrids have been obtained between apple and pear, red and black currant, *Prunus Besseyi* and apricot, *Prunus spinosa* and peach, plum and peach, currant and gooseberry, wild and cultivated strawberry, sweet and sour cherry, and *P. Besseyi* and *Cerasus tomentosa*.
The apple x pear hybrids are much more frost-resistant than the ordinary pear varieties. The hybrids of *P. Besseyi* x apricot were obtained by using a mixture of pollen and have proved partially fertile.
The currant x gooseberry hybrid was obtained by the intermediary method, crossing a hybrid currant with a gooseberry variety; it is spineless and bears its berries in clusters, these being dark red and intermediate in form. Valuable hardy peaches and other promising hybrids have been obtained by similar methods.
*P. Besseyi* x apricot hybrids grafted on *P. Besseyi* and on the Siberian apricot proved much hardier than those grafted on southern apricots.
By environmental influence certain sterile interspecific strawberry hybrids have been made fertile; their sex was also changed. Fruit bearing in many fruit tree hybrids was accelerated by intensive manuring and other environmental influences.

783. Jakovlev, P. N. 634:575.127(47)
**(New Michurin varieties).**
Jarovizacija 1940 : No. 3 (30) : 45–52.

The most promising of Michurin's seedlings that have come into bearing since his death are described. The seedling Anis Crab No. 1589, bears fruits which measure 76mm. x 89mm., weigh 183 grm., ripen in winter, and have an excellent flavour; the tree will tolerate temperatures of −38 to −40° C.
The pear Seedling No. 15, a seedling of Forest Beauty, raised on a quince seedling as rootstock, is regarded as Michurin's best summer pear; its fruits weigh over 200 grm., and have a melting flesh with good flavour, a fine muscat aroma and low tannin and acid contents.
Two apricot seedlings, from the cross Michurin's Tovarišč [Comrade] x Nikitskii Belyi [White Nikita] approach southern varieties in fruit characters but have much greater hardiness. Their fruit is of good quality and weighs 28–29 grm. in No. 4 and 38 grm. in No. 7. Flowering is about 7–9 days later than in the previous Michurin varieties, which often enables them to escape the frosts.
From crosses of Michurin's Liqueur Sorbus (*S. aucuparia* x *S. melanocarpa*) with the cultivated pear a seedling was obtained which, when grafted on *S. aucuparia* gave fruit of unusually large dimensions (average diameter 11 mm.), with juicy, somewhat bitter flesh from which an excellent preserve can be made. The hybrid is to be grafted on to the sweet "Dessert" sorbus to reduce the bitterness of the fruits.

784. Lesjuk, E. A. 634:575.127(47)
**(Michurin's varieties of fruits).**
Jarovizacija 1940 : No. 3 (30) : 53–80.

Descriptions are given of the main varieties produced by Michurin, grouped according to qualities such as earliness, yielding capacity, flavour and attractive appearance, keeping capacity, suitability for preserving, immunity, hardiness and ornamental properties.

785. 634.1/2:581.162.5:576.356.5
Johansson, E. 634:577.16
Nyare undersökningar på fruktodlingens område. **(Recent investigations in the sphere of fruit cultivation).**
Sverig. Pomol. Fören. Årsskr. 1940 : **41** : 72–84.

This report includes a survey of the results obtained by workers such as Steinegger, Heilbron,

Wanscher and Einset, on fertilization in apples, pears, plums and peaches and its genetical and cytological basis. The advances in the production and study of tetraploid forms of apples and pears are also mentioned.
English experiments with *Rubus* hybrids are recorded in a separate section.
In conclusion the results obtained at Alnarp in determinations of the vitamin C content of various fruits are briefly stated.

786. Šablovskii, B. I. 634.11:575.12:575.3
**(Root grafts of hybrids on mentors).**
Jarovizacija 1940 : No. 4 (31) : 87–94.
Roots from the apple variety Babuškino x Jonathan were grafted on to a number of varieties differing widely in constitution; bridge grafts were the most successful. When the graft had taken, the branch uniting it to the mother tree was removed, leaving the portion of the root as the only union between the end of the shoot and the base of the mother tree. This root tissue very soon became as frost resistant as the rest of the aerial tissue and frequently also formed young shoots. The colour of the grafted root acquired a colour corresponding rather closely to that of the particular variety on which it was grafted. This was particularly evident in grafts upon wild species. The author is confident that the hereditary constitution of the hybrid will be altered in the direction of the species or form used as mentor.

787. Rubtsov, G. A. 634.13·576.16
**Origin and evolution of the cultivated pear.**
C. R. (Doklady) Acad. Sci. U.R.S.S. 1940 : **28** : 350–53.
The main progenitor of the western cultivated pear is the wild *Pyrus communis*, but other wild species are concerned in its ancestry. The ancestors are probably to be found in mountainous regions of the Caucasus, Asia Minor and Soviet Central Asia, where great diversity exists to-day and the process of domestication is still proceeding.
Factors influencing the development of cultivated types are environmental conditions, mutations, change in the direction of natural selection, the beginning of artificial selection and isolation from wild forms. Natural hybridization and different initial centres of cultivation have led to great polymorphism. By the action of all these factors and the transference from east to west, varieties were created in ancient times representing all the chief modern cultivated types.
In the 18th and 19th centuries there was a great increase in pear cultivation in Belgium and France and much creation of new varieties, special attention being paid to flavour. This breeding work was based on a rather narrow range of material, though wide enough for the rather uniform conditions of western Europe.
New demands are made on the breeder by the wider spread of pear cultivation and a much wider range of material is needed. *P. serotina* Rehd. and *P. betulaefolia* Bge. are promising parents when earliness and resistance to fungous and bacterial diseases are required, *P. ussuriensis* Maxim. for hardiness and *P. salicifolia* Pall., *P. syriaca* Boiss., *P. heterophylla* Rgl. et Schmalh. and *P. Korshinskyi* Litw. for drought resistance.

788. Nilsson, F. 634.13:576.356.5·581.04
Tetraploidi hos päronplantor framkallad med hjälp av colchicin. **(Tetraploidy in young pear trees produced with the aid of colchicine).**
Sverig. Pomol. Fören. Årsskr. 1940 : **41** : 103–07.
The production and economic value of tetraploid forms of apples and pears are discussed. From the author's experiments on germinating pear seeds in colchicine and treating most of the seedlings subsequently with colchicine agar he obtained two plants with tetraploid ($2n = 68$) roots and two other plants whose roots were composed of diploid and tetraploid tissue. These effects were found in the Williams and Herrepäron [=Bergamotte] varieties. Some of the forms with diploid root tissue had leaves of the tetraploid type. These seedlings had been brushed with colchicine agar at the later stage of their growth.

789. Rubtsov, G. A. 634.13:581.143.7:576.16
**Ontogeny, age modifications and anomalies in the development of the pear.**
C. R. (Doklady) Acad. Sci. U.R.S.S. 1941 : **30** : 79–81.
After describing briefly the juvenile characters of several *Pyrus* species the author points out that in general the different species are closer to a common type in their juvenile stage than

when mature. Some phylogenetic conclusions can be drawn from juvenile characters. The dissected leaves of young seedlings of Chinese species indicate affinity with *P. Pashia, P. heterophylla* and *P. bucharica* which have both entire and dissected leaves when mature. This conclusion agrees with the geographical distribution. *P. salicifolia* frequently has dissected leaves when young, confirming its close affinity to *P. heterophylla* indicated by other characters. The occurrence, though more rarely, of dissected leaves in other species, including *P. communis* strengthens the hypothesis of a monotypical origin of the genus.
Referring to the "vegetative pears" produced by the abnormal growth of leaf blades and petioles or the tips of shoots, the author mentions that he found them in varieties inclined to flower a second time (Jules Guyot, Finland Yellow). If this character could be fixed and developed it might have practical importance.

790. Duka, S. Kh. 634.22:575.127.5:634.21
**(Hybrid between plum and apricot).**
Jarovizacija 1940 : No. 3 (30) : p. 215.

Hansen's hybrid Opata (*Prunus Besseyi* x *P. triflora*) was pollinated with apricot in 1938 and 100 stones were obtained, giving rise to 1 seedling in 1939. The seedling at 1·2 m. height was intermediate in type, having roots coloured like those of the apricot. It remained undamaged by a temperature of —35° C.

791. Dahl, C. G. 634.22:578.088:581.47
Plommonstenarnas betydelse för bestämning av plommonsorter. (**The importance of the stones of the plum for determining plum varieties**).
Sverig. Pomol. Fören. Årsskr. 1940 : **41** : 96–102.

Kobel's work on distinctive differences in cherry varieties and Roder's on the different varieties of plums are referred to and the latter contribution forms the main basis for a survey of the morphological variations in plum stones of diverse types with reference to their value in identifying varieties of plums.

792. 634.25:575(73)
**Finger printing peach trees. Development of early bearing peach tree.**
Amer. Fruit Gr. 1941 : **61** : 7, 20.

An attempt is being made to work out a system of accurate identification of varieties of peach by measuring the size and shape of leaves and twigs. Crosses involving the Ying Tsui (Eagle's Beak), a Chinese variety of honey peach with a long, curved point, are being selected to produce trees bearing in June, i.e. a full month ahead of the major peach crop.

793. Bacchi, O. 634.3:576.312.35
Observações citológicas em citrus. I. Número de cromosômios de algumas espécies e variedades. (**Cytological observations in citrus. I. The chromosome numbers of certain species and varieties**).
J. Agron. S. Paulo 1940 : **3** : 249–58; also Bol. Téc. Inst. Agron. Estado, Campinas 1940 : No. 85.

Root tip counts showed 18 somatic chromosomes in a number of varieties of *C. medica* L., *C. aurantifolia* Swingle, *C. limonia* Osbeck, *C. sinensis* Osbeck, *C. aurantium* L. and *C. mitis* Blanco. The Tahiti lime (*C. aurantifolia* Swingle) proved to be triploid ($2n = 27$). Certain specimens received under the name "Citron of Commerce" (*C. medica* L.?) proved to be hypertriploids with $2n = 28$. Eight seeds of this form were sown and gave rise to four seedlings, one of which was a hypotetraploid ($2n = 33$) and another a hyperdiploid ($2n = 21$).

794. 634.322:575.127.2
634.22:575(47)
Zorin, F. M. 634.54:575.127.2
**(Michurinites in the Soviet Subtropics).**
Jarovizacija 1940 : No. 3 (30) : 164–70.

A number of different forms of citrus were used to pollinate *Citrus unshiu* and large numbers of seeds have been obtained. An interesting hybrid with the lemon is distinguished by thin orange coloured skin, separating freely, the flavour of the flesh being that of the mandarin with a suggestion of the lemon.
Certain apogamous seedlings of *C. unshiu* were hardier than the original plant.

Two new plums are described. The first is Komsomolka, a seedling of the French variety Sainte Cathérine; the second a hybrid of Vengerka Ažanskaja [? Agent Prune) x Renklod Vol'stona [? Walston's Greengage]. Both have given good yields and been free from disease. Some of the new hazel hybrids have proved superior in quality and oil content to the local forms and to the American Barcelona nut.

## VARIOUS SMALL FRUITS 634.4

795. Murri, N. M. 634.451:575.42:581.6(47)
**(The best varieties of the oriental persimmon).**
Soviet Subtropics 1940 : No. 11–12 (75–76) : 33–36.

From a collection of 120 varieties brought together in the U.S.S.R. the All-Union Breeding Station for Crops of the Humid Subtropics has selected some useful varieties that can be recommended for multiplication on a large scale. Among them are some new constant tannin-free forms which have no astringent qualities. The varieties Jiro, Delicious, and Twentieth Century are superior even to the variety Fuyu grown in America.
In some of the new tannin-free forms the vitamin C content does not fall when the fruit ripens.
In selecting a suitable assortment of forms of commercial value, in addition to the new constant tannin-free types the best of the more variable and of the older importations in which the astringency disappears as the fruit ripens should also be included.
Varieties for use as pollinators should be selected too and in order that plantations and cultural operations may be as uniform as possible the number of commercial varieties chosen should be relatively small.
An annotated list is given of each constant tannin-free variety and pollinators recommended for inclusion in the standard collection for regions in the U.S.S.R.
The relatively high frost resistance of the oriental persimmon should make it possible to extend its area of cultivation northwards.

## NUTS 634.5*

796. Gravatt, G. F. 634.53–2.4–1.521.6
**Blight-resistant chestnuts.**
Proc. Ann. Meet. Nut. Gr. Ass. 1940 : 17–19 January : Pp. 3.

No American chestnuts (*Castanea dentata*) are resistant to blight (*Endothia*). Resistance is found in the Chinese hairy chestnut (*C. mollissima*) and in the Japanese chestnut (*C. crenata*). Asiatic chestnuts also appear to be resistant to *Phytophthora* root disease (*P. cinnamomi*).

797. 634.54:575.127.2
Čapljaev, S. K. 634.551:575.127.2
**(From work on breeding nuts).**
Jarovizacija 1940 : No. 3 (30) : 157–59.

Crosses of the local wild hazels with Michurin's hybrid filberts have given good sets and the hybrids have proved very hardy; hybrids made in northern zones were hardier than those made in the south.
A hybrid between *Amygdalus nana* and the almond Nikitskii No. 33 has shown marked heterosis in both vegetative and fruit characters and flowers abundantly.

798. Fedorako, B. I. 634.54–1.524(47)
**(On the form manifoldness of hazel in the forest-steppe zone of the western Pre-Urals).**
Priroda (Nature) 1940 : No. 10 : p. 71.

Numbers of well defined forms have been found, differing in leaf, fruit and habit. Three extreme forms are described, one early maturing type with abundant small fruits, one large fruited early form of low yield and one a large fruited late form of moderate yielding ability. Interest is expressed in the selection of the wild forms with the highest yield and hardiness.

799. Kalmykov, S. S. 634.574–1.524(47)
**(The pistachio tree in Kazakstan).**
Soviet Subtropics 1940 : No. 11–12 (75–76) : 53–55.

This paper contains notes on flowering of the pistachio in Kazakstan, varietal differences in the fruits and their chemical composition including oil content, differences in the time of ripening, yields and vigour of growth. With such variation selection should result in economically useful forms.

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* See also Abst. 614 (Groundnut).

800. ALIEV, D. 634.64–1.524(47)
**(The black pomegranate).**
Soviet Subtropics 1940 : No. 11–12 (75–76) : p. 56.
In the course of a study of the local varieties of pomegranates in Azerbaijan the black pomegranate (termed Karanar in the vernacular) here described was discovered. The chemical composition and the main characteristics of its fruits have been analysed. Cuttings from it take less readily than those from other varieties, but it is hoped that standard varieties for economic exploitation may be developed after the various local pomegranates of the region and their synonyms have been fully studied and identified.

801. ŠAŠKIN, I. N. 634.65:575.127.2
**(The regulation of the time of flowering and hybridization in *Actinidia*).**
Jarovizacija 1940 : No. 3 (30) : 218–19.
Attempts to pollinate *A. arguta* with *A. Kolomikta* failed because the latter species flowers much earlier. In 1937 the early shoots were destroyed by May frost and flowers developed from dormant buds somewhat later, thus making it possible to cross the two species. About 1,000 seeds were obtained. One hydrid seedling was obtained and has proved exceptionally frost resistant.
Flowering was also delayed artificially by covering the shoots with earth for 25–30 days; in this way 1,500 well filled seeds have been obtained by crossing.

802. HOFMEYR, J. D. J. 634.651:577.8:575.11
**The genetics of *Carica papaya*.**
Chronica Botania 1941 : **6** : 245–47.
In *Carica papaya* ♂♂, ♀♀ and ☿☿ occur, the ♂♂ being distinguishable by secondary as well as primary sex characters. The ♀♀ are most stable in their sex, the ☿☿ least. Segregation in crosses between the different forms shows that ♀♀ are genetically $mm$, ♂♂ $M_1m$ and ☿☿ $M_2m$. The genotypes $M_1M_1$, $M_2M_2$ and $M_1M_2$ are lethal. The genes $Yy$ (yellow *vs.* white stem colour) and $Pp$ (purple *vs.* non-purple stem) are linked with the sex factors, the order and linkage being $M$–25–$Y$–16–$P$. Seed skin colour, a character showing metaxenia, is determined by a single pair of allelomorphs, $B$ (grey) and $b$ (black); this locus is also in the sex chromosome, the linkage with the sex factor being about 30%. Disturbances in the sex ratio in some crosses can be explained in terms of a gametophytic factor lying between $M$ and $Y$, nearer to $M$ and affecting pollen tube growth.
All the different sex types have 9 equal pairs of chromosomes. It is suggested that $M_1$ and $M_2$ represent small inert regions of a sex chromosome which carries predominantly female determiners, while male determiners predominate in the autosomes. If it is assumed that vital genes have been inactivated in the $M_1$ and $M_2$ regions the lethality of $M_1M_1$, $M_2M_2$ and $M_1M_2$ is explained. The following numerical values may be assigned to the different types of sex chromosomes: $m = 25$, $M_1 = 21$, $M_2 = 22$; the value $-47$ is given to the autosomes and we have the following resultants $mm = +3$ (♀, stable) $M_1m = -1$ (♂, less stable) $M_2m = 0$ (☿, least stable). An inhibition of crossing-over is postulated to explain how the three forms maintain their identity.
Inbreeding for as many as 5 generations by sib-crossing has led to no appreciable loss of vigour and has made possible the isolation of many distinctive types. The ♂♂ and ♀♀ do not differ in vigour. The sex linked characters may be of commercial value in permitting the selection of seedlings for probable sex.

803. HODGSON, R. W. 634.653:575(79.4)
**Avocado research at the University of California, Los Angeles—progress and plans.**
Yearb. Calif. Avocado Ass. 1940 : 33–35.
Evidence, as yet inconclusive, has been obtained from top-working experiments that there exist strains of the Fuerte variety differing in yielding capacity.
Breeding work on avocados has been started and a chamber has been constructed in which controlled cross pollination can be effected by bees.

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* See also Abst. 614 (Coconut).

804. Popenoe, W. 634.653–1.524
**Origin of the name "Fuerte".**
Calavo News 1941 : **15** : p. 5.
Avocado introductions by Carl Schmidt were received at the West India Gardens in 1911 and budded by the author on seedlings of the Mexican race planted for the purpose. One variety was outstanding in its high percentage of successful buddings and the vigour of its early growth. The author's father suggested for it the name Fuerte, meaning in Spanish "strong, robust."

## SMALL BUSH FRUITS 634.7

805. Rozanova, M. A. 634.71:575.127.2:576.354.46
**Autosyndesis in the genus *Rubus*.**
C. R. (Doklady) Acad. Sci. U.R.S.S. 1940 : **29** : 143–45.
In a 28-chromosome hybrid of the parentage [*R. Idaeus* L. ($n = 7$) × *R. caesius* var. *turkestanicus* Regel ($n = 14$)] × *R. Idaeus* L. ($n = 7$), 14 bivalents were formed except in some cells where 1 or 2 quadrivalents appeared. It is argued that some of this pairing is autosyndesis of *R. caesius* chromosomes.

806. Duka, S. Kh. 634.723:575.127.5:634.725
**(A new form of berry. Blackcurrant x gooseberry).**
Jarovizacija 1940 : No. 3 (30) : 119–22.
Mixed pollen of a number of species of gooseberry was applied to blackcurrant plants, giving rise to 37 hybrid seedlings, all of which were free from spines and without the characteristic blackcurrant smell. One of these seedlings fruited abundantly, the fruits, up to 2cm. long with diameter 1·5 cm., being borne in quantities of 1–3 per bunch. The skin is thick and separates fron the flesh, which is acid-sweet with a faint suggestion of the blackcurrant flavour; the fruits are seedless. The hybrid is readily multiplied by cuttings.

807. Meurman, O. 634.725:575(47.1)
Edeltäviä tietoja karviaismarjapensaskokeista. **(Preliminary information on gooseberry bush trials).**
Valt. Maatalousk. Tiedon. 1939 : No. 166 : Pp. 14.
Trials from 1934–38 with numerous Finnish varieties of gooseberries including Pellervo (the Standard), C. F. Packalén and Lepaan valio have shown that progress has been made in breeding improved forms. Valio Nos. 1, 2 and 4 were on the whole the most satisfactory of the new varieties, as judged by yield, weight of 100 berries and freedom from disease.

808. Darrow, G. M. 634.75:575(73)
**The Maytime, Starbright and Redstar strawberries.**
Circ. U.S. Dep. Agric. 1940 : No. 597 : Pp. 5.
Descriptions are given of the three following new varieties of strawberries:
Maytime (U.S.D.A. 2267) is a selection from a cross between Missionary and Fairfax and is outstanding in earliness, high quality and firmness in Eastern Maryland.
Starbright (U.S.D.A. 2120) is a midseason variety developed from a cross between Chesapeake and Fairfax.
It is distinguished for its beauty and high quality and also has good shipping qualities.
Redstar (U.S.D.A. 2124) is a very late, firm variety also derived from a cross between Chesapeake and Fairfax.

809. Afanasiev, M. M. and
Morris, H. E. 634.75:575.061.6
**Yellowing in everbearing Progressive strawberries.**
Phytopathology 1941 : **31** : p. 1. (Abst.)
Yellowing in the Progressive strawberry is believed to be genetical in character. It is transmitted through the seed and by runners but cannot be transmitted by grafting or by the insect *Myzus fragaraefolii*. Healthy seedlings have been obtained from five plants which remained free of yellowing for several years and they have been multiplied by runners.

810. Šaškina, L. M., and
Šaškin, I. N. 634.75:575.127.2
**(Experiments and results of breeding strawberries and wild strawberries).**
Jarovizacija 1940 : No. 3 (30) : 123–38.

The results of a large number of interspecific crosses in *Fragaria* are reported. Control plants emasculated and pollinated with *Rubus* showed that the mere mechanical operations were not sufficient to induce apogamous development of the ovaries.

In the crosses of *F. grandiflora*, the variety Ziger x *F. collina* gave 95 hybrid plants, all sterile with the exception of one, which was almost fully fertile and frost resistant; its fruits however were not of commercial quality. From the cross Caton's Wonder x *F. collina* 42 plants were obtained, all fertile and all resembling *F. grandiflora* both in fruit quality and winter-hardiness. They segregated in the next generation, in which certain characters resembling the *F. collina* parent were detected.

Leopoldshalle Late × *F. collina*, gave 6 seedlings, 5 fertile and 1 sterile, all of the maternal type but of improved hardiness.

Jukunda x *F. collina* gave 126 seedlings, of which 105 resembled the maternal species, and 21 were intermediate; these and some of the maternal types were sterile, only 71 plants being fertile. All plants were intermediate in cold resistance. Some of the fertile seedlings gave plants showing certain characteristics of *F. collina* in their progeny.

Fifty-three seedlings were obtained from Ziger x *F. elatior* (variety Milan) and were all intermediate. Other varieties of these species when crossed gave no set at all; nor did Caton's Wonder or Roščinskaja pollinated by Arabka (*F. elatior*).

Plants of *F. elatior* pollinated with Ziger gave 25 plants all of the maternal type; some variations occurred in the next generation. Seedlings of the *F. elatior* variety Arabka were pollinated with mixed pollen from a number of varieties of *F. grandiflora* and gave 43 seedlings, mostly of the maternal type, but somewhat hardier. Segregation of both parental types and a number of intermediates occurred in the following generation, with a reduction in winter-hardiness. Certain other combinations of the same species failed altogether.

Twenty-four plants were obtained from the cross Arabka (*F. elatior*) x *F. vesca*; all were intermediate, 9 were fertile and the rest sterile. The variety Milan pollinated with *F. vesca* gave non-viable seeds. No success was obtained in pollinations of *F. elatior* with *F. orientalis*, *F. collina*, *Rubus deliciosus* or the hybrid Texas x Abundant.

*F. collina* gave no set when pollinated with various forms of *F. grandiflora* but when a mixture of pollen was used 6 seedlings were produced, 1 of the maternal and 5 of the paternal type, though some of the latter differed in details.

From the above results the authors conclude that the variety Ziger when used as female produces intermediate hybrids but when used as pollen parent has little influence on the progeny; the variety Jukunda when crossed with *F. collina* gives some seedlings of maternal, some of intermediate type; Caton's Wonder and Leopoldshalle Late give mainly hybrids of the *F. grandiflora* type, though the seedlings of the second variety deviate in respect of sterility and winter-hardiness.

Different varieties of *F. elatior* also give different results; the seedlings of Arabka crossed with *F. grandiflora* give mainly seedlings of the maternal type, while the so-called Common Wild Strawberry (Klubnika Obyknovennaja) gives no viable seed even when pollinated with a mixture of varieties. This amply illustrates the importance of a careful choice of varieties in making interspecific crosses. The most promising seedlings were obtained from Jukunda x *F. collina*, these being distinguished by winter-hardiness combined with a number of other desirable qualities. Other promising combinations were Caton's Wonder x *F. collina* and *F. collina* x (Ziger + Roščinskaja + Apricot), though further work will be required on these to make them sufficiently cold-resistant. The seedlings of *F. elatior* x *F. grandiflora* were very hardy but promising economic types appeared only in the second generation.

By taking cuttings from hybrids growing in good soil and planting them in poor soil seed setting was induced in a number of hybrids which when left untouched bore no seed at all.

811. Dogadkina, N. A. 634.75:575.127.2:576.356.5
**A contribution to the question of genome relations in some species of *Fragaria*.**
C. R. (Doklady) Acad. Sci. U.R.S.S. 1941 : **30** : 166–68.

From the cross *F. vesca* ($2n = 14$) x *F. grandiflora* ($2n = 56$) four pentaploid hybrids were

obtained. At meiosis these usually produced $14_{II} + 7_{I}$, though two cases of quadrivalent and one of trivalent formation were found. The course of meiosis was very irregular and no more than 10 to 20% of nearly normal pollen was produced.
Other pentaploid hybrids were obtained from the cross *F. orientalis* ($2n = 28$) x *F. elatior* ($2n = 42$). At meiosis they formed quadrivalents, trivalents, bivalents and univalents. The proportion of normal pollen varied in different plants and at different times, from practically none to as much as 70%. The seed fertility also varied.
From these and other workers' results it is argued that the hexaploid species *F. elatior* and the tetraploid *F. orientalis* are autopolyploid in the sense that related diploid species contributed to their formation. Their genoms are considered to be similar to that of *F. nipponica*, which is similar to that of *F. vesca* and to three of the four genoms of *F. grandiflora*.

812. Jeffers, W. F.,
Darrow, G. M. and
Temple, C. E. 634.75–2.411.4–1.521.6:575
**Progress in breeding for resistance to the red stele root disease of the strawberry in Maryland.**
Trans. Peninsula Hort. Soc. 1940 : **30** : No. 4 : 49–52.

The variety Aberdeen has never been found to be affected with red stele (*Phytophthora* sp.) and may possibly be immune. Aberdeen x Dorsett and Aberdeen x Fairfax seedlings have been tested for their red stele resistance by planting them in heavily infested soil. About two-third of the progeny of each cross were resistant. Further tests suggest that Aberdeen and two Scottish selections, BK46 and BK52, are immune, that Redheart and Mastondon are resistant and that Fairfax, U.S. 2629, Blackmore, Catskill and Dorsett are susceptible varieties. Seedlings from crosses between these varieties have also been tested for their resistance. Most of the resistant seedlings came from crosses in which Aberdeen was one of the parents. Though BK46 and BK52 are immune to red stele they are worthless under Maryland conditions and are also very unsatisfactory parents.

## VITICULTURE 634.8

813. Kobel, F. 634.835:575.11(49.4)
Ein Beitrag zur Sortenzüchtung bei der Europäerrebe. (**A contribution on the breeding of European vine varieties**).
Landw. Jb. Schweiz 1940 : **54** : 807–15.

The hybrid Riesling x Sylvaner was emasculated and artificially pollinated with pollen from Räuschling and from Gutedel. The first cross gave 929 seeds, of which 140 germinated, and 83 vines of bearing age were ultimately obtained. The second cross produced 951 seeds, 236 seedlings and 106 vines that reached the age for bearing.
Both crosses showed transgressive segregation for earliness, about 10% of the seedlings ripening earlier than the medium early Riesling x Sylvaner and about 10% later than the two medium late pollen parents. Forms ripening earlier than Riesling x Sylvaner may be of value as dessert grapes.
Size and density of the cluster are also conditioned by more than one pair of factors; and the two pollen parents do not differ much in the transmission of these two features, though the somewhat larger berry of Gutedel is evident in its progeny.
Berry shape is somewhat complicated in inheritance. Both pollen parents have round berries while Riesling x Sylvaner vary from oval to ovate. The progeny of Räuschling showed considerably more oval berries than that of Gutedel.
More than one factor pair appears to be responsible for golden yellow berry colour and green respectively. The green of Sylvaner appeared only in offspring from Räuschling.
Berry size shows transgressive segregation, but vines with larger berries than those of the large berried parent are less numerous than vines with smaller berries than the female parent.
The Gutedel cross gave a higher percentage of fully fertile vines though some of the hybrids remained entirely sterile during the ten years of observation. The Räuschling hybrids all bore at least some berries.
Yield was transmitted very much better by Gutedel and the average yield (for three years) from the Gutedel hybrid was considerably higher than from the Räuschling hybrid; but the sugar content was lower. The Räuschling hybrids were, however, again superior in flavour and bouquet.

Other characteristics recorded were quality of the flesh, sugar and acid content, muscatel flavour and leaf variegation.
Another cross Frühburgunder x Schwarzer Veltliner (a Gamay form found only round the Lake of Zürich) resulted in weak vines with low yields. A quarter segregated out as yellow berried forms, indicating that the parents were heterozygous for berry colour.

## FORESTRY 634.9*

814. 636.97:575
634.97.00.14

**The Commission on forest seeds and tree race problems of the International Union of Forest Research Organizations.**
Chronica Botanica 1941 : **6** : p. 207.

One of the purposes of the above Commission is to organize a repetition of the 1906 provenance experiment. Seed of 55 sources of *Pinus sylvestris* and 36 sources of *Picea excelsa* was distributed in 1938 and sown by stations in Europe and the U.S.A. A uniform lay-out consisting of 5 replications, with plots of 200 plants, spaced 1·3 × 1·3 metres has been agreed on. Preliminary plans have been made for starting new international provenance experiments with *Quercus pedunculata, Larix europaea* and *Abies pectinata.*
Other aims of the Commission include the compilation of a tree seed bibliography and co-ordination of research in forest genetics.

815. 634.972.3:575.127.2:575.3
JABLOKOV, A. S. 634.51:575.127.2:575.3
(**Differences in the $F_1$ interspecific hybrids of woody forest trees**).
Jarovizacija 1940 : No. 4 (31) : 33–40.

Flowers on a number of different branches of *Juglans mandshurica* were pollinated with pollen from one and the same tree of *J. Sieboldiana.* The hybrids from different branches differed in pubescence of branches, stickiness, time of maturity and in characters of the flower and fruit, some resembling one parent and some the other, though all showed clear differences from the mother tree. Different hybrids from the same branch were identical.
In pollinations of *J. mandshurica* with *Hicoria* or *Pterocarya* a very much better set was obtained when flowers on a weak lateral twig were pollinated rather than flowers on strongly growing twigs.
Again, in crosses between *Populus tremula* L. and *P. Bachofenii* v. *pyramidalis* the hybrids from some catkins were more like one parent, those from others more like the other parent. The same phenomenon was observed in crosses of *P. alba* L. x *P. Bachofenii* v. *pyramidalis* x *P. nigra* L. Seeds from hybrids grown on their own roots and grafted on to *P. nigra* v. *pyramidalis* were different and gave rise to plants of different type.
The type of hybrid produced by crossing trees growing in the open differed from those produced from crosses performed on cut branches in the laboratory.

816. ALBENSKY, A. V. 634.972.3:577.8:575
(**Changing the aspen from a monoecious into a dioecious plant**).
Proc. Lenin. Acad. Agric. Sci. U.S.S.R. 1940 : No. 19 : 27–29.

The author records an instance of hermaphrodite flowers in the aspen. The condition was not inherited. Among nine interspecific hybrids of aspen x white poplar however, dioecious, monoecious and even heterosexual individuals were found to occur. One of these hybrids had only staminate flowers, four had only pistillate flowers, two failed to flower and on two (Nos. 16 and 19), flowers of both sexes were found either growing separately to form male or female catkins or together in one and the same catkin. The stamens and fruits developed quite normally and there was sound seed in the fruits of all the florets; this has given rise to hybrid seedlings of the second generation.
Whether the phenomenon described is regressive or the reverse is still a moot point.
The equal sex ratio that might have been expected on Correns' theory to arise from the heterogeneous types of sex expression was not observed. If sex is connected with the presence of sex chromosomes, then some peculiar combination of chromosomes must be postulated for the two trees discussed.
The phenomenon is not the result of environmental influences nor is it a racial characteristic. Further observations of these hybrids are to be made.

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* See also Abst. 614 (Shade trees).

817. FREEMAN, O. M. 634.973:575.127.2
**A red maple, silver maple hybrid.**
J. Hered. 1941 : **32** : 11–14.

$F_1$ hybrids were obtained by crossing the red maple (*Acer rubrum*) as ovulate parent with the silver maple (*A. saccharinum*). Since the silver maple flowers earlier than the red, the pollen of the silver maple had to be stored in gelatine capsules which were kept in corked vials in a refrigerator. The hybrids grew much faster than the red maple but not so fast as the silver maple. The form of growth and leaf type of the hybrids showed much variation. The hybrids contain both staminate and pistillate plants and are nearly completely sterile. One hybrid tree, a staminate plant, has a distinctly columnar habit of growth and might be useful where a narrow tree is wanted for landscape effect. This tree can be easily propagated from greenwood cuttings.

818. SCHWEIZER, J. and
COOLHAAS, C. 634.973:575.127.2(92.2)
Levering van oculatiehout van de nieuwe lamtoro-soorten. (**Supply of bud wood of the new lamtoro species**).
Bergcultures 1940 : **14** : p. 1557.

A certain amount of bud wood of the new forms of lamtoro (cf. "Plant Breeding Abstracts", Vol. XI, Absts 478 and 479) is now available for distribution from the Besoeki and the Central and East Java Experiment Stations. Attention is also drawn to the necessary precautions for planters who may wish to raise seedlings on holdings from *Leucaena pulverulenta* growing on their own plantations.

## VEGETABLES 635*

819. PREOBRAŽENSKII, G. N. 635:575(47)
**(15 years' work of the Birjučii Kut Vegetable Breeding Station).**
Ovoščevodstvo (Vegetable Growing) 1940 : No. 10 : 20–24.

Brief descriptions are given of a number of improved strains of tomato, cucumber, onion, cabbage, beet, carrot, egg plant, pepper, water-melon, melon and pumpkin.

820. 635.15:576.312.35
FUJUTA, T. 635.15:581.43:581.143.32
**(Chromosomes of Kori radish).**
Bot. & Zool. 1937 : **5** : p. 1558.

The Kori radish (grown at Kori in Kyoto) is distinguished by a certain spiral development of the root, the ratio of spiral to non-spiral roots in this variety being 18 : 5. The origin of the Kori type is unknown and it is not of economic value.
Interested in Tatebe's study of radish chromosomes (cf. "Plant Breeding Abstracts", Vol. IX, Abst. 504), the author examined his own Kori radishes and found they contained $n = 9$ chromosomes.

821. SAX, K. and
SWANSON, C. P. 635.25:575.243:537.531
**Differential sensitivity of cells to X-rays.**
Amer. J. Bot. 1941 : **28** : 52–59.

Differential sensitivity of cells to X-rays, as measured by the frequency of induced chromosome abberations, was investigated in *Tradescantia* and *Allium Cepa*. *Allium* microspores and root tips were found to be less sensitive than those of *Tradescantia*.

822. BERGER, C. A. 635.41:576.356.5:576.312.315
**Some criteria for judging the degree of polyploidy of cells in the resting stage.**
Amer. Nat. 1941 : **75** : 93–95.

The degree of polyploidy of root tip cells of *Spinacia* can be determined by counting the number of heteropycnotic satellites present, either in direct contact with the nucleolus or joined to it by a thin thread. Diploid nuclei have two satellites, tetraploids four and octaploids eight.

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* See also Absts 608 and 614 (Soya beans); Absts 608 and 755 (Peas); Abst. 755 (Lentils); Abst. 757.

823. KRICKL, M. 635.52:575(43)
**Züchtungsversuche beim Salat. (Breeding experiments with lettuce).**
Züchter 1940 : **12** : 243–49.

The experiments were made on the variety "Maikönig" as its resistance to great fluctuations in temperature and to late frosts makes it a most valuable variety for early spring growing. It is shown that by careful selection a form can be produced with the desired straight upstanding head. R. M. I.

824. PRYOR, D. E. 635.52–2.421.1–1.521.6:575.11
**A unique case of powdery mildew on lettuce in the field.**
Plant Dis. Reporter 1941 : **25** : p. 74. (Mimeographed).

In a test in California of several lines of lettuce one strain, No. 41858, was attacked by powdery mildew (*Erysiphe cichoracearum* D.C.) when all others were free. *Lactuca scariola* is susceptible to this disease and *L. sativa* usually resistant, resistance having been shown to be a simple dominant. The pedigree of No. 41858 showed that it had been crossed with *L. scariola* and grown for six generations in the Imperial Valley, where powdery mildew very rarely occurs. This is therefore a case of an undesirable recessive gene being carried in a breeding stock in the absence of conditions favouring its expression and elimination.

825. ERVIN, C. D. 635.61:576.353:576.356
**A study of polysomaty in *Cucumis Melo*.**
Amer. J. Bot. 1941 : **28** : 113–24.

Mitosis was studied in the root tips of four varieties of *C. Melo* and one variety of *C. sativus*. The chromosome numbers were found to be $2n = 24$. Two satellited chromosomes were observed in the normal monosomatic (diploid) cells. In addition to the diploid plates a large number of tetraploid (disomatic) cells were found. These occur regularly in the periblem of the root tips. A few tetrasomatic plates were also observed. Disomatic cells also occur in the dermatogen but they are very rare in the plerome. A characteristic feature of polysomatic plates is the frequent close pairing of sister chromosomes. Heat treatment produced no marked increase in the proportion of polysomatic cells. The effect of colchicine treatment was probably to produce polysomatic cells since such cells were found in all tissues including the plerome after treatment. An increase in the number of polysomatic cells in the roots of *C. sativus* was found after treatment with growth substances.

826. ABRAHAM, G. 635.615:575
**Bantam size watermelons find market. New variety "Little Midget" fits icebox and is shipped in crates.**
Market Gr. J. 1941 : **47** : 473, 475–76.

Mr D. Stanley Brown, a farmer in Blackville, S.C., has obtained a new variety of watermelon, "Little Midget", after seven years' selective breeding. Little Midget melons are small enough to be sold uncut for feeding four persons or the smaller of them for feeding only two. They will also fit the average family icebox or electric refrigerator. Their flavour is also stated to be excellent.

827. CURTIS, L. C. 635.621:575.125:575
**Yankee hybrid. A new first generation hybrid of summer squash.**
Market Gr. J. 1940 : **67** : p. 472.

Yankee Hybrid is the name given to the first generation hybrid summer squash between Early Prolific Straightneck and an inbred, C 10, developed by the Connecticut Experiment Station. The hybrid produces marketable fruit a week before the parents and trials have established its superiority. The technique for producing first generation squash seed is similar in every way to that practised in producing hybrid maize. The actual cost of the emasculation of the seed rows is low enough to encourage seedsmen to produce $F_1$ seed. (Cf. "Plant Breeding Abstracts", Vol. X, Abst. 1149.)

828. GABAEV, S. G. 635.63:576.356.5:581.04
**Experiments on colchicine and acenaphthene treatment of the cucumber for the production of polyploids.**
C. R. (Doklady) Acad. Sci. U.R.S.S. 1940 : **28** : 164–66.

As indicated by pollen grain size and to some extent by deformations of the leaves, polyploid tissue was induced in different varieties by treatment of germinating seeds and of young seedlings with acenaphthene vapour and by soaking seeds in colchicine solutions. The optimum and lethal dosages are given. Little success was obtained by wetting growing points with colchicine solution.

829. TKACHENKO, N. N. 635.63:581.162.3:578.08
**(Conditions for the best pollination and fruit development of cucumbers).**
Proc. Lenin. Acad. Agric. Sci. U.S.S.R. 1940 : No. 10 : 37–43.

A description of the cucumber plant and its flowering and fruiting precedes some observations on the effects of plucking and internal nutrition upon the set.

Artificial pollination before the flower opens simplifies requirements in bagging. The results of postponing pollination, and of weather and of the time of day upon its effectiveness were studied. Morning hours were found to be the most suitable.

Pollen from flowers 1, 2 and 3 days old showed on a three-year average a set of 47, 24 and 27% respectively. Pollen from anthers two-days old gave no set and from anthers one-day old resulted in the production of one fruit which proved to be parthenocarpic.

Pollen kept in paper bags in a room at 20 to 22° C. was viable only for 4 hours. The possible relevance of this finding to pollen carried by bees is indicated.

Discussing various techniques, and appliances for bagging, the author recommends the use of a cowl shaped parchment bag as being effective, cheap and free from various defects associated with other methods.

Directions are given for making the appliance. A circular box well pressed into the soil round the flower which is to be pollinated also gave good results.

830. KANGAS, J. T. 635.64:575
**Produce vegetable varieties adapted to New England.**
Market Gr. J. 1941 : **67** : p. 105.

The Home Garden tomato, which is a sister strain to the Victor tomato (see "Plant Breeding Abstracts", Vol. XI, Abst. 223), is determinate in growth and produces flower clusters close together at the base of nearly every fork. As a result of this habit of growth the new variety, although it forms only small plants, produces a large crop early in the season.

831. ROBBINS, W. J. 635.64:575.125:577.17:581.43
**Growth of excised roots and heterosis in tomato.**
Amer. J. Bot. 1941 : **28** : 216–25; also Science 1940 : **92** : p. 416. (Abst.)

Excised roots of two inbred lines of tomato, Red Currant (*Lycopersicon pimpinellifolium*) and Johannesfeuer (*L. esculentum*) and of their heterotic $F_1$ were grown in synthetic culture solutions for several passages. The solutions were supplemented with one or more of the following growth substances; thiamin, pyridoxine, nicotinamide and thiazole. In all the solutions except one the $F_1$ roots grew more rapidly and produced more dry matter than those of either parent. The roots of the parents differed in their responses to the various growth substances. It is also suggested that the excised roots of the hybrid produce a greater amount of an unidentified growth factor than those of the parents. The possibility that the effects of inbreeding and of heterosis are associated with the formation and utilization of vitamin-like growth substances is considered.

832. BOLDYREV, A. N. 635.64:575.3:581.165.71
**(The question of changing the nature of plants by grafting).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1940 : No. 6 : 5–7.

Seedlings from tomato grafted on to potato differed from the controls in colour and pubescence, and at a later stage the young plants differed also in leaf form, flowered earlier and bore floral bunches intermediate in type between the tomato and potato, with an average of 14 flowers per bunch. The average fruit weight was 82 grm., the fruits having 5 to 9 locules and being lighter in colour and flatter than the controls.

A reduction in vegetation period was obtained by grafting lupins on to broad beans or peas and tubers were produced on sunflower roots after grafting with Jerusalem artichoke.

833. PASHCHENKO, T. E. 635.64:581.162
**(Biology of tomato-flowering).**
Proc. Lenin. Acad. Agric. Sci. U.S.S.R. 1940 : No. 12 : 15–19.

The contradictory findings of previous investigators of the problem of cross-pollination in the tomato are reviewed, due emphasis being given to varietal, climatic and other environmental factors as causes of the discrepancies found.

Differences in the floral structure of different varieties with reference to the relative positions of styles and anthers are described.

Apparently short styled flowers are self-pollinating, while those with the pistil on a level with or superior to the anthers may, it was found, be cross-pollinating to a slight extent in Southern localities when the plants are close together and the weather is dry and sunny.
An experiment by the author with 21 varieties gave only 2·1% of cross-pollination. Shaking the flowers assists pollination, and a set twice as large was obtained when the bags were shaken as when they were not.
Pollen transference by the wind was found not to occur except possibly to a very slight extent at a distance of 50 cm. Thrips are regarded as a possible agent for conveying pollen though only to short distances.
The stigmas in tomatoes mature 5 to 7 days before the flower opens and retain their receptivity for 4 to 5 days after that. The pollen matures 2 to 3 days before the opening of the flower. The best time for emasculation is the evening of the day before the flower expands—and for pollination, the morning of the following day.

834. 635.646:576.312.35

TATEBE, T. 635.646:575.12:581.162.5

**(On the chromosome numbers of certain horticultural varieties and an instance of phenospermy in the eggplant).**

Bot. and Zool. 1937 : **5** : 1735–36.

A study of the chromosome number was made with 23 varieties of egg plant including a few not previously studied. All showed $n = 12$.
One variant form, Tomago, was somewhat dwarfed, had no prickles on stem or leaves and had egg-shaped fruits. Attempted crosses with this variety as the pistillate parent and Yamashina as the pollen parent were unsuccessful, but the reciprocal gave seed of which 300 were sown with $F_1$ seeds from other crosses. None of the 300, however, germinated though the others did. After a further unsuccessful attempt to obtain germination, some of the seeds were opened and the contents found to be much less than in seeds of Yamashina.

835. 635.651:575.127.5:635.656

NOVIKOV, V. V. 635.651:575.127.2

**(Pea-bean hybrids).**

Jarovizacija 1940 : No. 3 (30) : 106–18.

Plants of *Vicia Faba* were emasculated and pollinated with various other *Vicia* species, both singly and in pollen mixtures. The results showed that selective fertilization occurred, the maternal plant selecting the pollen of the species most closely allied to it morphologically and biologically; species of identical chromosome number were not specially favoured. Thus from the cross *V. Faba* x *V. narbonensis* + *V. hirsuta* + *V. sativa* the seedlings were of clearly hybrid type, resembling *V. Faba* in the middle leaves and *V. narbonensis* in the upper leaves. Segregation was observed in the later generations. The cross *V. Faba* x *V. narbonensis* + *V. hirsuta* gave rise to hybrids showing heterosis, vegetatively of the *V. Faba* type but bearing seeds resembling *V. narbonensis*, maturing exceedingly early, 54 to 58 days from sowing. Segregation in the later generations was almost entirely confined to vegetation period, which varied from 54 to 120 days. All these hybrids both in the $F_1$ and later generations had $2n = 13$.
The presence of very distantly related species in the pollen mixture definitely retarded fertilization whereas if only closely related species were employed the mixed pollen effected fertilization more rapidly than single species.
One of the $F_2$ hybrids of the latter cross was crossed with the pea variety Alaska and with $F_1$ hybrids of Alaska x Capital. From the latter cross and its reciprocal, hybrids resembling *V. narbonensis* in the lower leaves and *Pisum sativum* in the upper leaves were obtained. Some bore seeds of the pea type, others of the bean type. These hybrids had $2n = 12$.
Some of the hybrids were erect in habit; these forms, and those of excessively early maturity, are thought to be of possible practical interest.

836. STROMAN, G. N.,
CARTER, J. (jun.) and
OVERPECK, J. C. 635.652:575(78.9)

**Pinto bean improvement.**

Bull. Agric. Exp. Sta. New Mexico Coll. Agric. 1940 : No. 270 : 3–17.

Pinto beans, *Phaseolus vulgaris*, are the most widely grown field beans in New Mexico. Details are given of the selection work which has been carried out at the New Mexico Agricultural

Experiment Station from 1934 to 1939. Selections were made for plant type, early maturity, uniformity of pod setting and uniform colour markings on the seed. The new strains have been tested under dry farming and irrigation conditions.

837. ZAUMEYER, W. J. 635.652:575.11.061.633
**The inheritance of a leaf variegation in beans.**
Phytopathology 1941 : **31** : p. 26. (Abst.)

The inheritance is described of a type of leaf variegation which is expressed both in the primary and the trifoliate leaves. It is controlled by two major factors giving a ratio of 15 green : 1 variegated in $F_2$. Not all the variegated plants bred true and it is believed that this is due to the action of modifying factors obscuring the expression of the major factors.

838. GENTER, C. F. and
BROWN, H. M. 635.652:575.243:537.531
**X-ray studies on the field bean.**
J. Hered. 1941 : **32** : 39–44.

Dormant seeds and seeds germinated for 18 and 36 hours before treatment were given the following X-ray dosages, 2160, 6500, 13,000 and 26,000 *r*-units. The effect of the irradiation was to increase the number of seeds which fail to germinate, to produce seedlings without apical buds and which died and also to retard the growth and development of the plants. Seed was harvested from many of the treated plants and in the following year 1,434 progenies were grown. One hundred and fifty-two of these progenies contained mutants; 67% of the mutant types showed chlorophyll abnormalities, 42% died in the seedling stage or soon afterwards and of those that survived until harvest time 57% were dwarfs or small plants. Most of the mutating progenies showed only one type of mutant. The proportions of mutants in the progenies suggested that many of the treated plants were chimerical for the induced mutations.

839. ZAUMEYER, W. J. and
HARTER, L. L. 635.652–2.452–1.521.6:575.11
**Genetic studies of resistance to six physiologic races of bean rust.**
Phytopathology 1941 : **31** : p. 26. (Abst.)

The inheritance of resistance to races 1, 2, 6, 11, 12 and 17 was studied under greenhouse conditions with 5 crosses involving 6 varieties. Resistance to races 1 and 2 was due to a single factor, but more than one factor was involved in the case of the other races. Resistance to races 1, 2, 6 and 12 was dominant and resistance to races 11 and 17 was incompletely dominant. With races 11 and 12 it is believed that a major factor governs resistance from grade 0 to 4 and a similar factor susceptibility from grade 5 to 10 (extreme susceptibility). Transgression of the parental resistance was observed with race 11.

840. 635.652–2.7–1.521.6:575.061.6
KNAPP, O. 635.652:581.6:575.061.6
Beitrag zui Frage der Qualitäts- und Immunitätszüchtung bei Buschbohnen.
(**Contribution to the problem of breeding for quality and for immunity in dwarf beans**).
Züchter 1941 : **13** : 19–21.

While the preserving industry and the German Reichsnährstand prefer white seeded varieties, there is a popular belief among growers that varieties with coloured seeds have more resistance to pests and diseases.

An attack of weevils (*Psalidium maxillosum*, *Tanymecus palliatus* and *T. dilaticollis*) on the author's breeding plots provided clear evidence that strains with coloured seeds suffered less damage. It therefore appears that the preference of preservers for white seeded varieties should not be allowed to cause an elimination of all coloured seeded varieties, which are quite suitable for the home garden and for the fresh market.

The varieties with coloured seeds have reddish or purple pigments in the cotyledons, hypocotyl and unripe pods and the author infers that these pigments are associated with differences in flavour making such varieties unattractive to insects and to human consumers. He suggests that insects might be used to detect fine distinctions in flavour.

841. MILNER, R. T. 635.655:575(73)
**News from the Regional Soybean Laboratory.**
Proc. Amer. Soybean Ass. 1940 : August 18, 19, 20 : Dearborn, Mich. : 36–38.

A very brief account is given of the part played by the U.S. Regional Soybean Industrial

Products Laboratory in work on varietal improvement. Close co-operation is maintained between agronomists and chemists. Extensive selection is practised, the first eliminations being based on agronomic features. In the hybridization work evidence has been obtained that Dunfield and Mukden varieties contribute more to seed quality than other strains tested. Uniform nurseries for the study of early strains in the northern part of the soya bean belt and for late strains in the southern part have been established. Much more uniform results have been obtained in the latter. The nurseries have been of value in the early recognition and naming of the new varieties Mount Carmel and Pakota.

842. Aganjan, V. N. 635.655:581.6:575.1
**(Some data on experiments in raising the protein and oil content of soya bean).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1940 : No. 6 : 10–12.

Various combinations were made between lines differing in protein and oil content and variation was observed in both these qualities in the $F_2$ generations. Thus the oil content varied from 19 to 24·23% and the protein from 33·56 to 44·0%. The oil content was usually correlated negatively with protein content, but some hybrids with a tolerably high content of both were found and have been selected—e.g. No. 202 with 47·37% protein and 23·0% oil.

843. Šakurov, V. Z. 635.656:575.12:575.148
**(Intravarietal crossing in peas).**
Jarovizacija 1940 : No. 4 (31) : 112–14.

Certain plants of the pea Capital bearing empty pods were pollinated artificially from other plants of the same variety and formed fully developed seeds typical for the variety; these seeds when sown gave rise to perfectly normal plants. After intravarietal crossing 61% of the pods contained over 6 seeds, whilst the uncrossed population contained only 17·4% of such plants. The average number of seeds per plant was 76 as compared with 51 in the uncrossed population; the yield was thus materially increased.

844. Gagarin, G. D. 635.656:575.12:578.08
**(The technique of intravarietal crossing in peas).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1940 : No. 5 : p. 18.

By removing the various corolla parts successively with the thumb and forefinger from unopened buds the stamens are exposed and removed in the same way. This method causes less damage than emasculation by forceps and the percentage of selfing is negligible.

845. Šenjavskii, A. L. 635.656:581.162.3
**(Pollination with a mixture of pollen in a self-pollinated plant [pea]).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1940 : No. 5 : 19–22.

Emasculated flowers of the pea American Wonder were pollinated with pollen from other flowers of the same plant applied immediately before or immediately after pollen from another variety.

The proportion of hybrid seeds in the pods produced, varied according to the pollinating variety, being greatest with the variety Capital.

When the self pollen was obtained from the same flower instead of from another flower of the same plant the proportion of hybrid seeds was distinctly higher, particularly with the variety Alaska, where the percentage of hybrids was as high as that from Capital.

The actual number of seeds per pod was not influenced by the type of pollen which effected fertilization.

The influence of various factors on the germination of pollen in artificial media was studied. The age of the anthers was very important, the highest germination being given by pollen from anthers just about to burst. The size of the pollen grain was almost without influence on the germination.

Flowers of American Wonder were pollinated as follows: (1) with pollen from the same flower (2) With pollen from another flower of the same plant (3) With pollen from other plants of the same variety and (4) with the variety Capital. The ovaries were fixed after 24 hours and in group (1) there was no pollen germination, in group (2) germination had taken place in two

cases out of three and in groups (3) and (4) in one case out of two. Nor was there any marked difference in the length of the pollen tubes in the last three classes.
It is concluded that the advantage lies with pollen from a different flower regardless of whether this is on the same plant or a different plant or variety.

846. ŠAKUROV, V. Z. 635.656–2.7–1.521.6
**(A new resistant variety of pea).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1940 : No. 2 : 23–24.

Forms of pea that grow rapidly in the spring are less liable to damage by the pea weevil than are slow growing strains. Variety trials at the Kazan state Breeding Station have shown that Nos. 508 and 430 are among the more resistant strains.
Another pest, the pea *Aphis*, also attacks slow growing or late maturing varieties of peas and especially those with numerous branches and a dense inflorescence in which the pest can hide. One strain, Sarmat, No. 104 bred by the Station, is resistant. It is early and ripens before the aphid appears in full force and also gives a yield of 16 to 23 % more than standard varieties.

847. GLOTOV, V. 635.72:576.356.5:581.04
**Amphidiploid fertile form of *Mentha piperita*. L. produced by colchicine treatment.**
C. R. (Doklady) Acad. Sci. U.R.S.S. 1940 : **28** : 450–53.

Two races of *M. piperita* are known, one with $n = 18$ chromosomes and the other, according to the author, with $2n = 64$. Both forms are probably of hybrid origin and are very highly sterile.
By treating small pieces of rhizome of the $2n = 64$ race in 0·8% colchicine for 72 hours the author has induced chromosome doubling, as shown by restoration of fertility and verified by chromosome counts in the root-tips.
Tetraploid plants are hardier than the diploids and are self-fertile; their pollen grains and stomata are larger and their leaves larger and relatively broader.

# BOOK REVIEWS

De Vries, L. 5:030.8

**French-English science dictionary for students in agricultural, biological, and physical sciences.**

McGraw-Hill Publishing Company, Ltd., London 1940 : 24s. 6d. Pp. viii + 546.

This dictionary has been planned on the same lines and with the same object as the author's German-English dictionary already reviewed in "Plant Breeding Abstracts" (cf. Vol. X, p. 64). This impressive though compact collection of 43,000 words composed mainly of terms referring to agricultural, biological and physical sciences, as well as a good number of literary terms, should be exceptionally useful to embryologists, cytologists, geneticists, botanists, morphologists, physiologists, ecologists, chemists, physicists, and medical research workers who may have occasion to consult French scientific papers on their particular subjects.

For those whose knowledge of French has been limited by a natural aversion to the labour of learning the irregular verbs, the author has provided a "way out" by including in his dictionary in many instances forms of the present, past, future and past participles of these verbs. There is no doubt these precarious stepping stones will be as useful and as much appreciated by those for whom they are intended as the large numbers of idioms which have also been included, many of them based upon verb forms.

Once again an enormous amount of knowledge and labour has gone to assembling this valuable product of academic and technical collaboration; the author and his co-workers are to be congratulated on the result.

The publishers too, have maintained their usual high standard for works of this kind. The contrast in the type used for key words and for explanatory terms is particularly effective and useful in a dictionary so closely packed with isolated items that must stand out in relief. The price should, even in these "hard times", bring the book within the reach of all libraries and institutions interested.

Chambers, E. G. 519:24

**Statistical calculation for beginners.**

University Press, Cambridge 1940 : 7s. 6d. Pp. viii + 110. 4 figs. 7 tables.

As indicated by its title this book does not claim to be a treatise on the theory of statistics. Its purpose is to explain as simply as possible how to perform the calculations involved in the commoner statistical methods. This makes for simplicity. The student beginner often prefers to follow at first simple instructions and to learn how to handle the new tool, leaving the question why and to what end to a later study.

This thorough understanding of the psychology of the student-beginner is the main asset of the book. The first chapters in particular are well written and should be easy reading for the beginner. They deal with averages, measures of dispersion, the normal distribution, significance of mean and difference between two means, and are well provided with exercises in the style of a text book. Certain tabular and graphical aids are compiled in useful appendices, one of which gives a table of the generalized geometrical mean

$$\frac{n_1 n_2 (n_1 + n_2 - 2)}{n_1 + n_2} \text{ for } n_1,\ n_2 = 10\ (1)\ 50$$

which facilitates the $t$-test for the difference between means.

With the second more advanced part of the book we begin to feel more of the disadvantages of divorcing method from the subject-matter to which it is applied. To explain the $\chi^2$ test it would have been simpler to commence with the problem of the experimenter and to introduce $\chi^2$ as its natural solution.

Naturally the scope of the book is confined to the more elementary statistical methods and the author had to make a selection. The requirements of the biologist are not fully satisfied. No mention is made of the binomial theorem, no complete account given of the analysis of variance let alone more advanced questions such as tests of linkage, etc. Nevertheless the book should be of great help to the beginner.

H. O. H.

PETERS, C. C. and
VOORHIS, W. R. VAN 519.24
**Statistical procedures and their mathematical bases.**
McGraw-Hill Publishing Company, Ltd., London 1940 : 31s. 6d. Pp. xiii + 516. 51 tables. 42 figs.

The non-mathematician who has to use statistics of some degree of complexity often shares the feelings of a man who has been blindfolded and is trying to follow somewhat cryptic instructions guiding him along a path which he knows to be skirting most dangerous pitfalls. It is the object of the book under review to ease this purgatory by removing at least a large part of the bandage as painlessly as possible. In the authors' words, they seek "to explain the mathematical origins of the most widely used statistical formulas in terms that persons with comparatively little mathematical training can easily follow." There is no doubt that working carefully through this book would give the student a better understanding of statistical methods and more confidence in using them than are felt by most people who use them.

Though there is a tendency for the authors to cater for psychological and sociological students, particularly in the choice of examples and in the attention devoted to correlation, all users of statistics will find the book of value, for all the fundamental procedures are covered, including the analysis of variance and the $\chi^2$ test.

The book is well written, well produced and provided with tables and an index.

SNYDER, E. E. 57:9
**Biology in the making.**
McGraw-Hill Book Company, Inc., New York and London 1940 : 20s. Pp. xii + 539. Illus.

The treatment of the history of biology in the book under review consists in taking different topics and sketching briefly the work of the better-known people associated with them. Some biographical details are also given. The book is apparently designed for school use. It is clearly, though not always accurately, written and well produced and illustrated.

It could be recommended as a quite useful introduction to biology for older school children. As a history it suffers from the grave but not uncommon defect that it does not give an adequate explanation of the causes of the development of biological science.

CATTELL, J. (Editor) 576
**Biological symposia. Volume I.**
The Jaques Cattell Press, Lancaster, Pa 1940 : Pp. vii + 238. Tables and figures.

In the present attractive volume are presented the contributions by distinguished biologists to three symposia—on the cell theory; mating types and their interactions in the ciliate Infusoria; and chromosome structure. The papers have already been published in the *American Naturalist* and those of more direct interest to plant breeders have been briefly reviewed in "Plant Breeding Abstracts" (cf. Vol. IX, Absts 1383, 1396 and 1400 and Vol. X, Abst. 343.)

SASS, J. E. 578.6
**Elements of botanical microtechnique.**
McGraw-Hill Publishing Company, Ltd., London 1940 : 17s. 6d. Pp. ix + 222. 33 figs.

This is a very well written account of the elements of botanical microtechnique and it is to be regretted that the rather high price of 17s. 6d. will probably limit the number of copies sold. There have been a number of mimeographed editions before this one and it is not surprising to learn that there was a very big demand for them. The book was designed to meet the needs of teachers, prospective teachers and beginners in research. It does not claim to be an encyclopedic work and the number of references given is small. The book is divided into two parts—general principles and methods and specific methods. In the first part there are accounts of fixing, dehydration, infiltration and embedding, microtome sectioning and staining. Embedding in colloidin is discussed as well as paraffin embedding. In the second part there are eight chapters—introduction, vegetative organs of vascular plants, thallophyta, bryophyta, pteridophyta (reproductive structures), spermatophyta (reproductive structures), the construction, use and care of the microscope, and photomicrography. A somewhat larger discussion of methods for studying dividing nuclei and chromosomes might very well have been included and it must be pointed out that the book does not give much space to accounts of such methods. The production and binding are of the usual high standard found in a McGraw-Hill book.

GRAINGER, J. 63
**Garden science.**
University of London Press, Ltd. 1940 : 2s. 6d. Pp. 265. 46 illus. 64 diagrams.

The publishers state that this book is designed to meet the needs of amateurs, horticultural students and pupils in school gardens. The subject matter appears to have been carefully chosen and on the whole the book gives a well balanced account of the elements of garden science. The treatment does not, however, appear to be in sufficient detail or of an advanced enough nature for horticultural students and in the reviewer's opinion the book is more suitable for schools. There are eight chapters—the seed, the green plant (this chapter discusses both morphology and physiology), the plant in relation to the soil (a good account of artificial manures appears here), vegetative propagation and pruning, the flowers (very brief accounts of mendelism, chromosomes, and self-incompatibility occur in this chapter), fungus diseases of plants, virus diseases of plants (the treatment of this subject is in more detail than might have been expected in an elementary text book) and insect pests. There are also two short appendices—experimental method and the planning of experiments and the planning of a school garden. A few minor mistakes and obscurities have been noticed—page 29, "a germinating seed produces sugar solution within, and therefore water enters"; page 105, "the practice of cutting potatoes immediately before planting is not to be recommended . . . ."; the last paragraph of page 157 on self-incompatibility in cultivated varieties of cherries is very misleading; page 177, it is not now generally accepted that *Bromus ardennensis* could act as a "bridging species" for a rust. Appendix 1 on "Experimental method and the planning of experiments" would be improved if mention were made of the method of randomized blocks. Also in discussing seed germination some account should surely be made of epigeal germination since this is the most usual type. It would also seem better in a book for British readers to use either the onion or the tomato as an example of endospermous seeds rather than the castor oil plant. The book is well illustrated and attractively produced.

The price of this cheap re-issue, 2s. 6d., is extremely reasonable and the publishers are to be congratulated on this point.

HAWKES, J. G. 633.491–1.524(8)
**Potato collecting expeditions in Mexico and South America.**
Imperial Bureau of Plant Breeding and Genetics, Cambridge 1941: 3s. Pp. 30. 11 tables. 1 plate.

As is well known and as is mentioned in the introduction to this bulletin, there were systematic Russian expeditions in 1925–32 to South America—the original home of the potato—and after the Russians there followed several other large scale expeditions by Germany, the U.S.A. and Sweden. It might therefore be thought that the whole of the available material would have been thoroughly surveyed and investigated by these expeditions. This is, however, far from the case, as the preliminary results of the Imperial Agricultural Bureaux' expeditions show.

Two separate potato collecting expeditions are described—the first by E. K. Balls, N. Balls and W. B. Gourlay in Mexico in 1938 and the second by E. K. Balls, J. G. Hawkes (the author of this bulletin) and W. B. Gourlay in South America in 1939. The South American expedition was the more extensive of the two as judged by time spent and number of specimens collected. The number of samples collected by the South American expedition was 1,164 and of these 42 were obtained in Argentina, 359 in Bolivia, 478 in Peru, 125 in Ecuador and 160 in Colombia. The Mexican expedition obtained 46 samples.

The route of the expedition, the methods of collecting, the distribution and primitive culture of the potato in South America and the utilization of the collections are all dealt with in this bulletin. Special attention is given to the distribution and primitive culture of the potato in the several countries visited. Of particular interest is the discovery of the custom of raising potatoes from true seed in parts of South Colombia and North Ecuador. The tubers raised in the first year are kept and planted again, the second year's harvest being large enough for eating purposes. This custom has not apparently been previously mentioned in the literature.

In the section on the utilization of the collections there is striking evidence for the suggestion that the previous expeditions had not thoroughly surveyed and investigated the whole of the available material. A diploid species from Mexico, *S. lanciforme*, has been found to possess complete immunity to blight under laboratory conditions. Under similar conditions the tetraploid species *S. Antipoviczii* and *A. ajuscoense* only show resistance. If *S. lanciforme* will

cross easily with cultivated types and if its immunity to blight is dominant like that of the hexaploid species *S. demissum* then this discovery alone would fully justify the sending of the two expeditions. It is also of considerable interest to note that over 30 samples of diploid types related to *S. Rybinii* and *S. bejucense* have been obtained. According to Bukasov, *S. Rybinii* has considerable virus resistance and Salaman (1938) also states that he has failed to infect it with both the Y virus and Leaf-roll. Bukasov himself only obtained a few clones of *S. Rybinii*. The 30 samples collected by the present South America expedition may thus be of considerable importance.

It is hoped to publish in a subsequent bulletin the results of the systematic and cytological studies together with the results of the tests for blight resistance. It is also hoped to make tests for cold resistance and resistance to virus diseases, etc. Finally it is pointed out that for those parts of the British Empire where potatoes are grown under short 12 hour days, *S. andigenum* and other Andean species may well prove to be a valuable and even indispensable basis for breeding varieties adapted to these conditions.

633.63.00.15(73 + 71)

**Sugar beet investigational work United States and Canada.** The American Society of Sugar Beet Technologists, Colorado 1941 : April : Pp. 27. (Mimeographed).

The main part of this publication consists of a classified list of sugar beet research projects in the U.S.A. and Canada, compiled by the American Society of Sugar Beet Technologists from the replies to a circular sent out on January 7 1941. A list is also given of the names and addresses of project leaders.

The headings under which projects of more direct interest to plant breeders occur are as follows: variety testing (20 projects), seed and seed production (26 projects), plat technique (1 project), genetics (13), cytology (8), breeding (23), biochemistry and plant physiology (8). The bodies concerned in the different projects are the United States Department of Agriculture, the Canadian Dominion Experiment Farms, the following states: Wisconsin, Michigan, Ohio, Minnesota, North Dakota, Montana, Wyoming, Colorado, New Mexico, Texas, Arizona, Idaho, Washington, Oregon, California and Ontario; the following companies: Manominee Sugar Co., American Sugar Co., Monitor Sugar Co., Spreckels Sugar Co., Central Sugar Co., Holly Sugar Co., Utah-Idaho Sugar Co., Western Seed Production Corporation, West Coast Beet Seed Co.; and the following which appear to be semi-public organizations: the Curly Top Resistance Breeding Commission and the Farmers and Manufacturers Beet Sugar Association. In many of the projects two or more of these bodies co-operate.

In the breeding projects a great deal of attention is being paid to disease resistance, to the use of inbred lines, to crossing with wild and cultivated relatives and to polyploidy.

The impression given by the list is that a lot of active work on sugar beet research is in progress, but owing to the numerous interests concerned, not very highly organized. It would not be surprising if in the not too distant future some Federal organizing body were set up on the lines of the Regional Laboratories.

SCHILLETTER, J. C. and
RICHEY, H. W. 634/5

**Textbook of general horticulture.** McGraw-Hill Publishing Company, Ltd. London 1940 : 21s. Pp. ix + 367. 136 figs. 36 tables.

The object of this book is to give an account of the essential principles of horticulture in a manner suitable for a general introductory college course. The first four chapters—General Horticulture, Horticultural Enterprises of the World, Horticultural Enterprises of the United States and Horticultural Enterprises of the Home—deal with the relation of horticulture to agriculture and to economic, political and social life. The fifth chapter deals with plant morphology and physiological anatomy and has apparently been included for the sake of completeness and as an introduction to the following chapters. Chapters VI to X discuss the relations between horticultural plants and their environment. These chapters give a very good account of those aspects of plant physiology which are of importance to the student of horticulture. Propagation, soil management, training horticultural plants and pruning are then considered. Finally there are chapters on pests of horticultural plants and their control and on harvesting and storing horticultural products. The book is very well illustrated. At the end of each chapter there are review questions, problems and suggestions for collateral reading.

## NEW JOURNAL

### The Nyasaland Agricultural Quarterly Journal.

The publication of the first issue of the Nyasaland Agricultural Quarterly Journal also marks the end of the Nyasaland Tea Association Quarterly Journal, which was first published in June, 1936 (cf. "Plant Breeding Abstracts", Vol. VII, page 123). The Nyasaland Tea Association, Ltd., will still remain responsible for the publication and financing of the new Journal but the editors will also have the fullest co-operation of the Nyasaland Agricultural Department. It is also pointed out that in the old tea journal there were many articles on Tung cultivation as well as on tea and in this first issue of the new journal there is a long article on "A simple method of budding tung trees". There are also short notes on cotton growing and on agriculture generally. The business address of the journal is P.O. Box 43, Blantyre, Nyasaland. (Four issues per volume; subscription 5s. annually).

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